VOL. X, NO. 3. 20TH MARCH, 1915.

New Zealand Department of Agriculture,
Industries, and Commerce.

THE

JOURNAL

OF

AGRICULTURE.

Published by direction of
The Right Hon. W. F. MASSEY, P.C.,
Minister of Agriculture, Industries,
and Commerce.

C. E. CUMING, Editor.

WELLINGTON.
BY AUTHORITY JOHN MACKAY, GOVERNMENT PRINTER.

1915.

The Shorthorn Herd of the Te Aute College, Hawke's Bay.

The

Journal of Agriculture.

WELLINGTON, NEW ZEALAND,

20TH MARCH, 1915.

WHEAT-GROWING.

DR. F. W. HILGENDORF, Lincoln College.

POSITION IN ROTATION.

WHEAT is a favourite crop with farmers, as it gives an immediate return, and can be made to grow under very rough conditions of cultivation, such as are suitable for cheap land with only primitive implements of tillage. But at the present stage of agriculture in New Zealand wheat is a very useful crop, in that it has the faculty of taking advantage of any residual manures in the soil, as well as of any natural fertility it contains. It can thus be taken at almost any place in the rotation. One of the best places is after peas, where the friable nature of the soil and the accumulation of nitrogen generally ensure an abundant crop with very little working of the land and very little manure. A favourite place is after rape, and here, too, the land is easily worked, and

the manures applied to the rape are available to the wheat. After turnips wheat-sowing is rarely practicable unless one takes the risk of sowing a spring crop—a matter that will be discussed later. To take wheat after grass or clover is a very frequent practice, but it requires a special procedure. The land should be skim-ploughed in March at the latest: it is often ploughed in February or January, or even as early as November by those who can afford to lose the summer feed. Such early ploughing produces a greatly increased crop. Whether it is profitable or not depends entirely on the value of the grass lost. Wheat is also taken after oats or after wheat. Such a practice, though rarely advisable, occasionally becomes, as it may do this year, a case of necessity.

CULTIVATION.

Wheat needs a fine but firm seed-bed. The necessity of firmness in the seed-bed is often overlooked, but the superior crop along the headland can often be ascribed to no other cause than the firming of the soil by horses and drays. It is sometimes recommended that after peas the land should not be ploughed at all, but merely disked two or three times, so that the coulters of the drill may cover the wheat. If the roller is used on land with any tendency to cake, it should be before and not after the cultivator. The land should not be worked too fine. Small lumps are no disadvantage on a field of autumn-sown wheat, so long as the lumps are on the surface and the fine tilth is underneath. The lumps, breaking down under the weather, provide a fine loose surface and prevent the land from caking too hard in early spring. Supposing the land is sufficiently moist and in good condition for working, one might suggest the following cultivation for autumn wheat: After peas, plough about 5 in.; work to nearly a sufficiently fine tilth, then roll, cultivate, and sow. After rape, the same procedure should be adopted, though a shallower ploughing—say, 4 in. to 4½ in.—will do equally well. In both these cases the spring-tooth cultivator is of great use, as it brings the clods to the surface and lets the fine soil shake down. After grass or clover, the land should be skim-ploughed in early March or earlier, and let lie for six or eight weeks. Then it should be finely disked, and ploughed with about a 6 in. furrow. This puts the tilth to the bottom and the lumps to the top, where they can be reached by the disks or harrows. Disking packs the loose soil and firms the seed-bed. The cultivator should be dispensed with in working such land, and the disks and harrows trusted to secure the necessary tilth. The double-ploughing is often objected to on the score of expense, but there can be no doubt as to its advisability. The grass is given time to rot and

to become suitable for plant-food, while a fine tilth at the bottom of the furrow is secured. If there is only one ploughing the grass does not rot, and is therefore useless to the incoming crop. Besides, the furrow is never worked to the bottom. The disks can work only about 4 in. deep, and below that is an inch or two of open grassy spaces through which the roots do not work freely. In fact, it has been proved that if grass land is ploughed only once for wheat, the second crop of wheat in succession is often better than the first, owing to the poor chance given the first crop. After oats or wheat, the stubble should be first disked, or cultivated with a heavy grubber, to encourage the germination of weeds, and in order to secure the fine tilth at the bottom of the subsequent 5 in. or 6 in. furrow. After ploughing, the work required to produce a good seed-bed should in this case be small in amount, but here the roller should be used before the final harrowing if the land is fairly dry. It is a good rule never to work the land when it sticks to the implements, and never to plough it when the mouldboard leaves a glossy sheen on the furrow.

TIME OF SOWING.

Wheat is a deep-rooting plant, and needs a long period to establish a satisfactory root-system. In Canterbury May is, as a rule, the ideal month for sowing, but if one cannot sow then, June will do equally well. Most farmers try to avoid sowing in July and prefer to wait till August, but often the July-sown crops are quite successful. It all depends on the weather of the succeeding spring. Wheat sown in August and September often does well, if the varieties used are either of the Tuscans or Bobs, and this has been notably the case in the past season, when the December rains were beneficial to the late-sown crops, but useless to those that were more nearly mature. Still, it is a very good rule to sow your spring wheats in autumn and to sow in spring only when forced by circumstances to do so. In Otago spring sowing is almost universal, and is much the most successful.

SCREENING, PICKLING, AND SOWING THE SEED.

It always pays to pass wheat through a grader before sowing. Nearly any threshing-mill will pass into the firsts a large number of seeds that, through being broken or shrivelled, cannot possibly germinate. In such a year as this such wheat might as well be fed to fowls as placed in the soil to rot. Beyond this, the bigger grain gives the plant a better start, and on the average this means a better yield. If the cost of screening is 3d. or even 6d. a bushel, it will take, with 5s. wheat, only 3 lb. or 6 lb. higher yield per

acre to pay for the expense, and the increased yield is, from many experiments, proved to be much more than this. Then, wheat should be pickled as a preventive against smut and bunt. Owing to using very small plots of wheat for experimental work, we were, some years ago, unable to pickle wheat for three seasons. The third crop was ruined with bunt or ball smut, as far as milling purposes went. It might therefore be safe to omit pickling for one year, but not for more; but bought seed should always be pickled. The most widely used pickle is bluestone: One ounce dissolved in one quart of water, sprinkled over 1 bushel of wheat emptied out on the barn-floor and turned with a shovel till all is equally moist. One and a half times to double this strength is sometimes used. The bluestone must be dissolved in a wooden or earthenware vessel. This substance, though a perfectly good preventive of smut and bunt, is an unsatisfactory pickle, especially when used strong, because it often kills a large proportion of the seed, and always distinctly retards the germination of the seeds that survive. Formalin is a better pickle, being as satisfactory a fungicide, and hastening instead of retarding germination. Make up the formalin solution as follows: Add 2 oz. formalin to 5 gallons of water—that is ¼ per cent. solution. Put the contents of a bag of wheat into two bags, tie firmly near the mouth, and soak the whole bag of grain in the solution for seven minutes, turning it over for the first minute to secure even wetting. Let the bags drain for four hours, or overnight, before sowing. Keeping the soaked grain for some days will not hurt; and the trough, after washing out, retains no trace of the slightly poisonous formalin. Those who prefer the turning-over method may use Clarke's carbolized wheat-protector, which is an efficient and conveniently applied pickle.

The quantity of seed to sow varies from 1 to 2 bushels. On light land with a small seed a bushel is enough. On heavy land with a large Tuscan grain 2 bushels is not too much; 90 lb. to 100 lb. is the average, using a little more for late sowing.

MANURING.

The avidity with which wheat seizes on residual manures has led to the practice of manuring the preceding root or forage crop and of not manuring the wheat. Still, it is now certain that wheat nearly always responds to phosphatic manures. Frequently 1 cwt. to 1½ cwt. of superphosphate per acre is used with advantage after peas or rape, or even after grass. Where lime is deficient, as in most of the Canterbury plains, basic phosphate is distinctly better than super. It is quite sufficiently quick in its action, and

adds lime as well as phosphate to the soil. Basic slag also shows good results, but perhaps the best is basic phosphate. Where wheat is taken after oats or after wheat, one of the freezing companies' wheat-manures is better as supplying some nitrogen, though its high price is in part due to the presence of that much overvalued manure, bonedust.

Avoid wheat after wheat if possible, as certain root-parasites of the nature of "Take-all" frequently do much harm to the second crop.

AFTER-CULTIVATION.

The harrows should always follow immediately after the drill to ensure all the seed being buried to the same depth. When the wheat has tillered in spring-time harrowing is a very necessary operation. In New South Wales farmers harrow their growing wheat till it is a foot high: without recommending quite so drastic a procedure, I am sure that we are often too much afraid of harrowing wheat. I often have to grub out wheat accidentally sown on the paths of experimental plots, and find it very difficult to uproot. I am sure that what the harrow kills is little or nothing. Harrowing breaks the crust on the soil, and so conserves the moisture that will be so important later on. Often the wheat may be fed off before the harrowing. This procedure is usually beneficial on fairly strong land, as it makes the wheat more sturdy. Even on light land the trampling of the sheep, if done in moderation, is beneficial. The Tuscans, however, do not stand feeding off, though certain varieties, such as Bordier, benefit immensely from it. With Hunter's Velvet and Pearl it depends on circumstances. When the wheat is about 9 in. high it is often rolled, though the procedure has not much to recommend it. It crushes surface clods, so making stooking easier and less dust for the binder. It may also perhaps firm the soil round loosened plants; but as it should not be done until the plants are high enough to shade the ground from all evaporation it probably has not much effect in this last direction. Rolling, however, can do little harm, though the good is usually slight.

TIME TO CUT.

When the grain, crushed between the fingers, produces a milky juice it is too green to cut. Later on, when, on being crushed, it appears doughy, it is then probably at its best for harvesting. This dough stage usually corresponds with the period when the straw is ripe, though the knots are still green. To leave the wheat longer than this will not, it is said, increase the yield, but it will thicken the husk, and so produce more bran in milling. The

weather and the possibility of shaking by wind-storms is, however, one's chief guide; and in general it may be said that if the field is of any considerable size, cutting should commence as soon as the straw is ripe, though not the knots, and the grain has reached the dough stage.

CHOICE OF VARIETIES.

The best wheat to grow on a large scale is the one with which you and your neighbours have had success. The worst one is probably that one which some neighbour or seed-merchant has tried for a year and got double the yield from. We are not the first generation that has tried all sorts of wheats in this country, and the fifty years' experience of our fathers is no bad guide. In a new wheat-growing district, or in the case of a wheat tried under experimental conditions for four or five years, it is a different story; but in most cases new wheats should be sown sparingly for several seasons.

Among the best yielding wheats, on the average of all wheat-growing land, are the Tuscans. White-straw Tuscan is probably the best. Purple-straw Tuscan is hardly obtainable now. Talavera and Marshall's White are good strains of Tuscan. Solid-straw Tuscan is a wonderful yielder for its appearance, and is pre-eminently the wheat for windy districts. Hunter's is a very good all-round wheat, combining moderate excellences in strength of straw, resistance to shaking, yield, and quality. Red Chaff is probably a different strain of the same wheat. Velvet and Pearl are somewhat low yielders, demand an even and fairly good but not heavy soil, and are apt to thresh out in the wind; but they give the best-quality grain grown in New Zealand. Bordier is a very high yielder on fairly heavy land, but it is somewhat susceptible to loose smut, and shakes easily in windy districts. Red Marvel, introduced from France by the Department, is becoming a favourite in some districts. Of the spring wheats, White-straw and Solid-straw Tuscans are the best known, but Bobs has a somewhat restricted vogue. In all cases one should aim at quantity. If quality can be obtained at the same time, well and good; but quantity should not be sacrificed for the sake of quality until millers are able to give a sufficiently increased price for better quality to compensate for diminished yield. Wheat at 3s. 4d. per bushel—an average price—is 40d. a bushel. On good wheat land 40 bushels is an average crop; so that 1d. a bushel is the same as a bushel per acre. Pearl rarely, if ever, brings more than 3d. per bushel more than Tuscan; therefore, if Tuscan produces 4 bushels per acre more than Pearl, Tuscan is the more profitable wheat to grow.

SAND CONTROL AND UTILIZATION.

W. J. McCULLOCH.

GEOGRAPHICALLY speaking, New Zealand has, in proportion to its area, an extensive coast-line with considerable stretches of sand reaching along its foreshores. No doubt, before the advent of the white settler, these sand areas were to a certain extent held in control by those provisions of nature — bush, scrub, grasses, and other natural growth; but with the arrival of the settler, and with him his stock, which grazed the fertile valleys and plains adjacent to the seaboard, this provision which nature in her wisdom had initiated to check the drifting sands and to slowly but surely turn them into productive soils has to a great extent been defeated. The grazing and consequent trampling of stock, together with mischievous firing, has broken the protective covering, and winds are now completing the destruction. The result of this is seen in the sand-drifts, which are in many places a serious menace to much of our good agricultural and pastoral country.

The accumulation of drifting sands on the banks of some of the larger rivers, though on a smaller scale, is also a matter for consideration; and in this case also man has probably played a part in interfering with the currents, thereby altering the natural channels of the streams, creating backwashes, &c., and generally filling the beds with sludge, which during a time of low water become dry, and is finally swept by the prevailing winds to a higher level. Instances of this are to be seen in Central Otago, below Clyde, and above Cromwell, on the Molyneux River.

It is of national importance that the problem of drifting sands should be vigorously attacked in the near future if we are to conserve the great areas of fertile agricultural and pastoral lands which are menaced. Our aim should be not only their control, but their ultimate conversion.

The first consideration in attempting to deal with a sand-drift is to locate the source of supply. This, as a rule, is easily discovered if one has a local knowledge of the direction of the prevailing winds. The next point for consideration is to select the season of the year when the prevailing wind is least severe. These two very important matters having been determined the control of the drift may be proceeded with. In the past, control was often

attempted by the erection of scrub fences or barricades in front or on the top of drifts, but the results have, almost without exception, been disappointing.

Sand-drifts have only been controlled successfully by reverting to nature's process — viz., the growing of suitable vegetation. The

WHITE LUPIN ON SAND.

ON THE PROPERTY OF MR. E. TEBBATT, MARSHLANDS, CHRISTCHURCH, GROWN UNDER THE DEPARTMENT'S SUPERVISION. THE SEED WAS SOWN AT THE BEGINNING OF OCTOBER LAST, AND THE CROP WAS TURNED IN ABOUT THE MIDDLE OF JANUARY, THE YIELD BEING 20·42 TONS PER ACRE.

experience of this Department so far has taught that no plants are better adapted for controlling severe drifts than marram and sea lyme grasses. Under ordinary conditions it is almost impossible to smother these plants when once they have become properly established. They have a tendency to collect the drift and so become

more or less covered after each gale of wind, but only for a time, as they speedily send their shoots through the accumulation of sand, and so by this natural process a high barricade of sand dunes is eventually formed. The usual method is to transplant these grasses, care being taken in digging them up to see that at least two complete nodes or joints are left on the roots. Sea lyme-grass is better adapted for planting on areas affected at times by salt water or spray and the marram for portions not so affected.

The usual practice is to plant with sea lyme a margin of a few chains, more or less, along the sea-front and close to what is considered the source of supply, continuing the planting for some distance back with marram. These grasses should be planted in rows 1 ft. to 3 ft. apart at right angles to the direction of the prevailing wind, the plants to be the same distance apart in the rows, and so arranged that only those in each alternate row will be exactly opposite.

When the drift has finally been controlled by the grasses, or where an area is not in a badly drifting condition, especially if such an area is within reasonable distance of market and therefore likely to become valuable, much may be done towards converting it into productive soil by green-manuring. Few plants are so well adapted for this purpose as the annual lupin. The principal value of this legume lies in its capacity to produce large crops of nitrogenous herbage on poor light soils and to assist in the reclamation of sand, thus causing large accumulations of nitrogen and humus, and making unproductive land capable of growing profitable farm crops. There are three well-known varieties of annual lupin, easily distinguished by the colour of the flower—White lupin (*Lupinus albus*), blue lupin (*Lupinus angustifolius*), and yellow lupin (*Lupinus luteus*). These are very much alike in habit of growth, all being deep-rooted, and having stout stems, which become very woody during the flowering stage. For soils inclined to be alkaline (soils containing lime in abundance), or brackish soils near the seashore, the white variety has so far given much the better results, and stands out prominently from the others in all experiments carried out in the South Island. The blue variety is readily injured by lime, and for this reason grows best on acid soils. Tree lupin (*Lupinus arboreus*), a perennial, grows from 3 ft. to 5 ft. in height, and forms a spreading bush. It is useful in reclaiming sand, but, owing to the woody nature of the foliage, it is unsuitable for green-manuring.

The usual method of growing annual lupin for green-manuring is to sow in spring after all danger of frosts has passed, in rows 14 in. apart on the flat at a depth of 2½ in., or more if the sand is dry,

and at the rate of 90 lb. per acre. Before sowing the seed should be soaked in water for twelve hours. Where it is desired to sow on sand of a slightly drifting nature, this is better undertaken in the majority of cases in the autumn, as there will then probably be less chance of the seed being uncovered or buried by sand-drifts. On very poor sandy soils, previous to sowing the seed superphosphate, kainit, and gypsum may be applied at the rate of 1½ cwt. to 2 cwt. of each to the acre, but in this Island annual white lupin has succeeded extremely well on sandy or poor soils without the assistance of any fertilizer. After germination the plants will grow very slowly at first, but when thoroughly established the growth is very rapid. The crop should be ploughed in for green-manuring at the commencement of the flowering stage, as after the development of the flowers the stems become woody, and succulence, being conducive to quick decay, is an important element in effective green-manuring.

As with all so-called light soils, sand should not be ploughed deeply and never too often, substituting the grubber and cultivator as much as possible, and always heavily rolling, immediately following with a stroke of brush harrows to form a dust mulch, thereby conserving moisture, one of the chief aims in cultivating such soils. Should liming be necessary, it should be applied in the form of ground limestone (carbonate of lime). If burnt lime is used on loose sandy soils the result will be harmful, as this acts quickly in assisting to make soluble certain constituents of the humus, and much leaching may occur, thereby destroying to a great extent the effect of the green-manuring. A few remarks anent the value of humus may not be amiss in considering the value of green-manuring. Humus, from its origin—being composed for the most part of decaying vegetation—must be one of the chief factors in forming a fertile soil. The soil is not, as many suppose, a dead inert substance, but is teeming with millions of micro-organisms. There are different kinds of these bacteria, each of which is doing some particular kind of work; for the most part, changing those substances in the soil which plants cannot utilize as food into soluble plant-food. Without this activity in the soil plant-growth would be impossible. The humus of the soil is full of the elements of plant-food which were absorbed from the air and soil by the plants which are now decayed therein; but humus itself is of no direct feeding-value to crops, yet when broken down by bacteria some of the products formed become available plant-food. As this decomposition goes on nitrogen in the form of ammonia is liberated, together with varying quantities of phosphates, potash, lime, &c., and as no soil can be fertile or suited for plant-life without these elements, it

will be apparent how necessary is the addition of humus to sandy soils. The conservation of moisture in such soils is very essential both for the well-being of the soil-bacterial life and to aid the assimilation of plant-food, hence the advice to roll heavily and follow by a light harrow, thus forming a dust mulch. Augmenting the humus-content of the soil by green-manuring has an important physical effect in making a sandy or porous soil more retentive of moisture and warmth. Therefore, whether the soil has been abused and depleted of its fertility or is naturally poor and lacking in humus, as in the case of most sand areas, one of the first considerations should be to supply the essential humus. One of the most practical methods of doing this is green-manuring.

POISONING OF STOCK BY RANGIORA.

THE Agricultural Chemist, Mr. B. C. Aston, would be greatly obliged if any farmer, sawmiller, or other observer would kindly collect and forward to him, at the Agricultural Department, Wellington, a supply of *rangiora* resin. This is the fragrant resinous matter which exudes from the freshly cut or wounded trunk, twigs, or young branches of the *Brachyglottis repanda* and *B. Rangiora.*

Several deaths of stock, horses, and cattle have been attributed to this plant, and the poison may possibly be found in the resin. Mr. Aston will be grateful for any information regarding the poisoning of stock suspected to be due to the *rangiora.*

[NOTE.—The *rangiora,* or white leaf, is the settlers' name for the common shrub bearing the large green leaves with the conspicuously white under-surface. It is abundant in the North Island, and occurs as far south as Kaikoura and Greymouth.]

It is unfortunate that as yet the farming community of New Zealand has not realized the benefits to be derived from seed-growers' associations, and that no responsible body exists to attend to the propagation of improved varieties of agricultural seeds.

Writing to Wellington friends, a prominent Argentine pastoralist firm says, "The *Journal of Agriculture* has reached us regularly. We find it extremely useful and interesting, as affording sound advice which applies to this country as well, by reason of the similarity in latitude and seasons to those of New Zealand."

CONSTRUCTIVE AGRICULTURE.

ECONOMIC PROMOTION OF SOIL-FERTILITY.

A. McTAGGART, B.S.A., M.S.A.

In the great laboratory of the soil natural processes or agencies are constantly building up while others are breaking down or taking away. The effective control of the latter processes in favour of the former, in conjunction with the work of producing from the soil, is what might be termed "constructive agriculture." Those silent workers of the soil — the nitrifying bacteria — that transform the nitrogen of decomposing organic matter into nitrates — and it is only in the soluble nitrate form that a plant can take up its food — are active only under suitable conditions of temperature and moisture. In districts of plenteous rainfall and comparatively mild climate, where low temperatures are seldom experienced, they are more or less active the year round, and nitrates are being continuously formed. In the light porous soils of such districts—and in light soils in general but to a lesser extent—considerable leaching-away of fertility takes place unless there is a crop of some kind—pasture or other covering — to take up the greater part of the fertility as it is made available by the bacterial action. The practice of undue exposure, then, of light soils, especially in winter with its more plenteous rainfall, in districts of a temperate climate is what might be termed "destructive agriculture." The object should be to grow in such soils a crop of some kind all the year round. Even on heavier and less porous soils in districts devoid of low temperatures and subject to a plenteous rainfall loss of fertility by leaching takes place, especially on exposed soils, rendering the practice of bare fallowing during periods other than those of absence of rain comparatively destructive. Stubble fields in such districts are, then, a special source of loss, and should be made to carry a crop of some kind in winter as far as is practicable. An effective method of providing this subsequent crop, to be used eventually for feeding off or for green-manuring, is to sow with the grain a little red clover or cow-grass, the growth of the accompanying legume also tending to stimulate the cereal crop. Such crops as rape, white mustard, and crimson clover can be grown on stubble

land by disking, broadcasting the seed, and harrowing in, and they provide valuable "catch-crops" for feeding off later.

The use of leguminous crops (clovers, lucerne, peas, vetches, &c.), or of crop mixtures with legumes therein, as even temporary occupiers of soils where leaching occurs, in itself is a decided step toward soil-building, in that legumes have the power of assimilating free nitrogen from the soil-air, apart from their performing the function of ordinary non-leguminous crops by taking up nitrates that otherwise would tend to leach from the soil in drainage waters. It is this special free-nitrogen-gathering power possessed by legumes, too, that calls for their use in every rotation of crops or in every pasture-mixture. It is doubtless this power also that largely stimulates the growth of a non-legume, like oats, grown with a legume, due to the extra nitrogen augmenting that already in the soil. Especially on soils naturally somewhat deficient in nitrogen, as indicated usually by absence of good dark colour of the soil, leguminous crops should, if possible, be made fullest use of either as temporary or permanent crops.

On soils that are porous (hence somewhat non-retentive of moisture), on soils naturally deficient in nitrogen, and on soils that are stiff or refractory, a commendable, if not essential, practice is that phase of "constructive agriculture," green-manuring. As in this country we do not house cattle, and little dung is produced, green-manuring is necessary to supply humus to soils such as those above described. In the light soils the incorporation of humus gives them more body, thereby rendering them more retentive of moisture and of the fertilizers applied. In stiff refractory soils, or soils inclined to bake, the humus provided by green-manuring renders them more friable and more easily and advantageously worked. The incorporation of humus in soils somewhat deficient in this material also causes greater use to be made by the growing crop of the fertilizers used. Attention to the humus-content of a soil by occasional green-manuring is therefore necessary. On soils obviously requiring humus a point should be made of growing a green-manuring crop on a definite area each year for the express purpose of "building" the soil. By this system the whole farm would ultimately be "made" without loss of season or without interfering to any extent with the work of productive farming. Indeed, the after-harvest period should be availed of, as mentioned above, for the growing of green-manuring catch-crops on stubble land for soil-improvement. Of course, legumes are the more desirable for green-manuring purposes. Where seed of legumes can be obtained at all reasonably their use is preferable; otherwise non-legumes whose seed is much cheaper, such as oats, white

mustard, or rape, should be used. Crops suited to poor soils and which are admirable for green-manuring purposes thereon, provided their seed is not selling at a dear rate, are—Prussian Blue pea, rye (rye-corn), sweet or Bokhara clover (*Melilotus alba* and *M. officinalis*), and buckwheat. The last-named will grow on the poorest of soils, and in the New York State of America is recommended for improving the poor Volusia clay soils therein — soils that will grow very few other crops effectively. An economical method of providing a subsequent crop for green-manuring purposes on stronger soils is that of growing Emerald rye and vetches or Cape barley and vetches. Both the rye and the barley could be fed off two or three times, and the subsequent growth used for ploughing under. While not so enriching to the soil as the turning-under of the first growth, yet the roots of the legume particularly, together with the later growth of the non-legume incorporated with the soil, provide an addition of humus with its combined nitrogen and carbohydrate material. As to the rapidity with which they become available after being ploughed under, green manurial crops correspond approximately to stable manure. In the turning-under of green manure a fairly upright furrow should be employed, as, if the furrow-slice is completely reversed or nearly so, a mat of green material results in the interfering with the natural rise of water from below by capillary action. Too much growth of the crop should not be permitted before ploughing it under, and a heavy chain should be attached to the beam of the plough to completely draw under all the green material. In a dry season, or during a period of absence of rain, green-manuring has to be handled very carefully, for when the soil is dry the slowly decomposing material will render the soil drier than it was formerly. For this reason green crops should be incorporated with the soil when soil-moisture is plentiful. During moist weather, then, is the best time to turn under a green crop. It has been shown in America that the ploughing-under of a good vigorous growth of red clover is equivalent to from 15 to 20 tons of farmyard manure to the acre, this estimation alone emphasizing the value to the farmer of green-manuring crops, especially legumes. Besides the nitrogen added through such crops, carbohydrate material is supplied. In a plant there is 70 or 80 per cent. of carbon, hydrogen, and oxygen, the constituents of carbohydrates, and these are of value to the soil. The nitrogen is added by means of legumes possessing nodules on their roots. Where these nodules are not present non-legumes (mustard, rape, rye, buckwheat, &c.) are just as beneficial.

In districts of plenteous rainfall, and seldom low temperatures especia considerable growth takes place, and the greater part of

this growth has in the past returned, and much is still returning, to the soil, there undergoing decomposition. In the process of this decomposition various organic acids are given off, and the accumulation of these acids brings about a condition of acidity in the soil.* This condition of acidity or sourness so brought about is increased by the tendency of the soil to become water-logged and to lack natural drainage. The presence of marked acidity in any soil prevents very materially the bacteria from performing their proper function — that of converting nitrogenous materials into soluble nitrates, or of assimilating free nitrogen from the soil-air and rendering it available for plant-growth. Hence neutralizing soil-acidity by lime—ground burnt lime for heavy soils containing an abundance of organic matter, and finely ground limestone (carbonate) for light soils and those deficient in humus—after effective drainage has been carried out is an important step in the direction of constructive agriculture. Eliminating acidity and providing a base for nitrate-formation by the use of lime tend to build up; and the stimulating of the non-symbiotic bacteria—those having the power of assimilating nitrogen from the soil-air without the co-operation of a leguminous plant — increase the nitrogen-content of the soil, which is also encouraged by the growth of legumes for which lime is an essential stimulant, as they will not thrive in the presence of acidity. Lime, then, may be regarded indirectly as a nitrogen-gatherer. In addition to it neutralizing acidity and providing a base for nitrate-forming bacteria, it converts free phosphoric acid into slowly soluble phosphate, and liberates for use by plants potash and to a lesser extent readily available phosphate; and it is the potash liberated that indirectly stimulates the bacteria in the nodules on the roots of legumes by supplying them with carbohydrates (sugars, starches, &c.), in the formation of which substances potash plays a very important part. These bacteria so stimulated increasingly assimilate free nitrogen from the soil-air. Thus potash — when supplied to leguminous plants either on soils somewhat deficient in it or indirectly by use of lime on soils containing an abundance of potassium in unavailable form—may also be regarded as a nitrogen-gatherer.

* It is interesting here to note that the reason given as to why the low-lying soils of the southern gulf States of America are somewhat deficient in phosphoric acid is because of the continuous and relatively rapid decomposition, under the suitable conditions of temperature and moisture of that region, of accumulated vegetable matter, causing a setting-free of this acid, which thus leaches away in drainage waters, the condition of acidity being maintained by the accumulation of other acids resulting from the breaking-down process. This, doubtless, explains the reason for the occurrence of similar conditions in this country.

The fact that pastures on hillsides and on light soils generally that formerly carried timber are now showing a tendency not to hold is largely due to the using-up of the available potash deposited as the result of the burning of the bush, by the herbage and the stock grazing thereon, and by its being leached away in the soil-water.

The stiffer, heavier soils possess a greater retentive power for such potash and plant-food generally. This fact, together with the greater natural richness of these soils, ensure an undiminished thriving condition of the pasture-mixtures sown thereon. Lime, however, applied to these better soils would greatly promote a more abundant and vigorous growth of vegetation of a higher nutritive value by liberating plant-food from the rich reserve of this held by such soils. Basic slag, which contains on the average 40 per cent. of lime, would also greatly increase the yield of nutritious herbage, especially of clovers, thereby very materially enlarging the carrying-capacity of the soil.

An economical means of building up the fertility of lightish free-working soils is that of growing thereon a succession of crops, and folding sheep on these. Crops such as oats, soft turnips, white mustard, rape, Cape barley (or Emerald rye), and vetches (winter feed), Buda or Thousand-headed kale, &c., grown successively and fed off, will greatly improve such soils, the droppings and trampling of sheep enriching the land and bringing about a better physical condition by consolidation. The continuous use of the plough on such a soil will not only increase production therefrom, but will also materially improve the land. Pastures on thin soils, inferior hill pastures, and ordinary land pastures that have been grazed continuously for some time by dairy cattle and by young growing animals can also be materially improved by extra heavy stocking for comparatively short periods with mature fattening sheep and fattening cattle. For this purpose, of course, comparatively small fields are necessary. The manure from the mature fattening animals is richer in lime, phosphoric acid, and potash than that from milk- and bone-producing animals; hence the great manurial value of the former to "run down" or inferior pastures generally. This important fact points to the need for the practice, where obviously necessary and where possible, of judicious grazing; consideration in the carrying-out of this being required with respect to the actual condition of the herbage and the class of animal grazed—that is, the value of the latter from manurial and grazing standpoints.

In districts where grain-growing is carried on the practice of a rotation of crops cannot be too highly valued. The continuous growing

of cereal crops on the same land without manure is very exhaustive of soil-fertility, particularly of the phosphate and nitrogenous wealth of the soil. Unless the soil is exceptionally rich the practice is not commendable, and even then a succession of cereal crops will show signs of soil-depletion. On the far-farmed rich Manitoba wheat lands, of late years, the average yield, according to statistics, is lower than it was formerly, showing that the vast reserves of plant-food therein are beginning to give out. In practice a cereal crop following a legume, or a mixture embodying leguminous plants, is recommended; and the growing in rotation of a turnip, swede, or rape crop, to keep up the phosphate wealth of the soil by means of the residue from phosphates supplied therewith, is considered advisable.

The growing of lucerne, as that of all legumes, comes within the sphere of "constructive agriculture." The great capacity that lucerne possesses for assimilating free nitrogen from the air and storing it up in its extensive growth of leaf, stem, and root render it a valuable asset to any farm, apart from the high feeding-value of the various cuttings which the crop is capable of providing in a single season. Nitrogen being the most expensive soil-constituent to supply, because of its being the most in demand on account of the relatively great ease with which it becomes depleted from the soil, a great nitrogen-gatherer like lucerne is a plant of considerable economic value. When once established on a light soil deficient in nitrogen lucerne brings about the desirable accumulation of the necessary plant-food, thereby ultimately enabling a soil to produce effectively those nitrogen-demanding crops which once refused to grow in it. With lucerne, especially, continuous cutting does not tend to deplete the soil of nitrogen; on the contrary, the extensive root-system enriches the soil therein. The essential requirements to a successful growth of lucerne are — The water-table must be at least 5 ft. below the surface; the subsoil must be fairly open and not be so stiff that it will render subsoiling impracticable; the soil must be well cultivated and clean; lime must be supplied in a liberal manner; the soil must be inoculated with the necessary bacteria peculiar to the lucerne-plant (by means of added soil that has already grown the crop successfully), unless it be rich alluvial river-flat land, in which case inoculation is not necessary.

These are a few of the more important phases of a system of agriculture which tend to conserve and build up without interfering with effective production. They are submitted for the consideration of those who wish to adopt progressive and profitable methods and who desire to conserve the natural resources of the country.

SEEDS AND THEIR IDENTIFICATION.

E. BRUCE LEVY.

GOOSE-GRASS (*Bromus hordeaceus*). Hair-grass (*Festuca bromoides*).

These two seeds are quite distinct from each other, and the difficulty is not in distinguishing each from each, but in being able to recognize either in the line of seed intended for sowing.

The main grass-seeds in which these two seeds are found as impurities are perennial rye-grass, Italian rye-grass, and cocksfoot. This second series of notes will be taken up in pointing out the distinctions by which one is able to detect in samples of these either of the two weed-seeds being dealt with.

To begin with, it is necessary to know the various parts of a grass-seed. The true seed of a grass is the kernel. The popular term "grass-seed," however, includes the covering of the seed by which it is protected during development.

The covering of most grass-seeds consists of two glumes or husks, one the outer flowering-glume, and the other the inner flowering-glume or palea. The outer flowering-glume of the seed of many grasses bears a bristle-like appendage which varies greatly in length and stiffness. This appendage is called an awn. At the base of most grass-seeds is another very distinctive structure called the rachilla, or seed-stalk.

GOOSE-GRASS
(BROMUS HORDEACEUS).

HAIR-GRASS
(FESTUCA BROMOIDES).

BACK AND FRONT VIEW. ENLARGED ABOUT 10 DIAMETERS.

GENERAL DESCRIPTION.

Of these five "seeds," all are rounded on the back except cocksfoot, the outer flowering-glume of which is distinctly keeled — so much so that in its natural position the seed lies only on its side. Goose-grass, perennial rye-grass, Italian rye-grass, and hair-grass are nearly straight along the back, but at times are slightly recurved. Cocksfoot, on the other hand, is distinctly arched along the back.

AVERAGE SIZE OF THE SEEDS.

	Length.		Width.
	Outer Flowering-glume.	Awn.	
	Inch.	Inch.	Inch.
Goose-grass	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{1}{13}$
Hair-grass	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{1}{32}$
Perennial rye-grass	$\frac{9}{40}$	..	$\frac{1}{18}$
Italian rye-grass	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{18}$
Cocksfoot	$\frac{5}{16}$	$\frac{1}{20}$	$\frac{1}{24}$

FROM LEFT TO RIGHT.
GOOSE-GRASS (BACK AND FRONT VIEW).
HAIR-GRASS (BACK AND FRONT VIEW).
E LARGED 6 DIAMETERS.

FROM LEFT TO RIGHT.
COCKSFOOT (FRONT AND BACK VIEW).
PERENNIAL RYE-GRASS (BACK AND FRONT VIEW).
ITALIAN RYE-GRASS (BACK AND FRONT VIEW).
ENLARGED 6 DIAMETERS.

COLOUR OF THE SEED.

Goose-grass: From a pale- to a dark-straw colour, a light purplish tinge being often noticeable.

Hair-grass: Variably straw-coloured; much darker in colour than is goose-grass. The palea is often a deep purple; the outer flowering-glume a light purple, running to a light-straw colour towards the awn.

Perennial and Italian rye-grass: From a light- to a dark-straw colour.

Cocksfoot: Generally a very light-straw colour; sometimes dark straw.

OUTER FLOWERING-GLUME.

The outer flowering-glume of goose-grass-seed is strongly nerved on the back (straight raised marks running parallel from base to tip), there being usually from five to seven nerves. Transverse wrinkles are also often present. Short bristle-like hairs generally cover the back and front of the outer flowering-glume, particularly towards the awn.

Cocksfoot is only slightly nerved, but shows the same number of nerves as in goose-grass.

Perennial rye-grass, Italian rye-grass, and hair-grass are not noticeably nerved. Italian rye-grass is often wrinkled on the back. Viewed from the front, the outer flowering-glume of goose-grass-seed is generally rounded and curved in, covering almost completely the toothed edge of the palea. That of perennial rye-grass, Italian rye-grass, and hair-grass is not so folded over, the palea in each case, particularly in hair-grass, being quite exposed. That of cocksfoot in some cases is very slightly folded over.

THE AWN.

The awn of goose-grass is short and stiff, varying in length from one-half to as long again as the outer flowering-glume. It arises near the terminus of the outer flowering-glume between the bifid (two cut) membraneous tip.

That of hair-grass is long and slender, being often longer than the outer flowering-glume. It arises from the terminus of the glume, with which it seems continuous. It is studded with very short, whitish, tooth-like bristles, which are continued down the glume to about midway.

The awn of Italian rye-grass is long and slender, being generally about as long as the glume itself. It arises near the terminus of the glume behind the membraneous (not bifid) tip.

Cocksfoot is very slightly awned. The awn when present is very short, rarely exceeding one-third the length of the outer flowering-glume.

Beside that of hair-grass the awns of goose-grass, Italian rye-grass, and cocksfoot are also studded more or less with short stiff bristles, those of Italian rye-grass being the longest.

Perennial rye-grass-seed has no awn whatever.

THE PALEA.

The palea of goose-grass is very thin, almost transparent, with comb-like teeth on the margin, which are partly hidden by the overlapping of the outer flowering-glume.

The palea of hair-grass is very thin and transparent, with small slightly curved teeth on the margin.

The palea of perennial and Italian rye-grass are fairly thick, and are not so transparent as that in goose-grass and hair-grass. The margin of the palea in each is toothed with small straight teeth, those in Italian being a little straighter and longer than those of perennial.

The palea of cocksfoot is thin and fairly transparent. The margin is densely toothed with fine irregular teeth.

THE RACHILLA, OR SEED-STALK.

The rachilla of the seed of goose-grass is round and club-like shaped, not closely appressed (lying closely) to the palea. It is covered by short minute hairs, except at the end. The end of the rachilla is flat and almost circular. It is not at right angles to the rachilla, but faces obliquely outward. The rachilla does not reach right to the base of the seed; at its base is a well-marked scar, which indicates the place of attachment for the seed immediately below in the same spiklet of the seed-head.

The rachilla of hair-grass is fairly long and slender, is slightly arched outwards at the middle, and is again turned outward at the end. The end is slightly enlarged. The rachilla does not reach quite to the base of the seed, but at the base no marked scar is present.

The rachillas of perennial and Italian rye-grass are both flat, are fairly smooth, and are closely appressed to the palea. The end is flat or very slightly crown-shaped, and is at right angles to the rachilla. The rachilla widens gradually from its base to its end. In both seed the rachilla rises near to the base of the seed, and no marked scar is present.

HAIR-GRASS, SHOWING MANNER IN WHICH "SEED" IS PARTLY SHELLED AND PARTLY DE-AWNED.

ENLARGED 6 DIAMETERS.

GOOSE-GRASS, SHOWING MANNER IN WHICH "SEED" IS PARTLY SHELLED AND PARTLY DE-AWNED.

ENLARGED 6 DIAMETERS.

The rachilla of cocksfoot is round, fairly slender, smooth, and straight or slightly curved outwards in the middle. The end is at right angles to the rachilla, is considerably enlarged, and is somewhat flange-like.

Goose-grass and hair-grass are often found in samples with their awns broken short, sometimes entirely removed; in very heavily dressed lines both may be partly shelled. In these cases, however, the rachilla, the colour, and the general appearance of the seed are sufficient to identify them from the seeds in which they are found.

The kernel of goose-grass is very distinct in form, having a perfectly rounded end, very much spoon-shaped.

The following table, compiled from analyses made in the laboratory, shows the relative frequency of occurrence of these three "seeds" in the main agricultural seeds:—

Agricultural Seeds in which found.	Of 100 Samples examined—	
	Goose-grass was present in	Hair-grass was present in
Perennial rye-grass	79	73
Italian rye-grass	62	69
Cocksfoot	70	24
Crested dogstail	..	42
Chewing's fescue	8	40
Timothy	..	2
Fiorin	..	4
Meadow-foxtail	17	8
Poa pratensis	..	2
White clover	..	3
Alsike	..	..
Red clover	2	4
Cow-grass	1	2
Lucerne	..	..
Lotus	3	9

Also in the following seeds:—

Goose-grass was noted in—	Hair-grass was noted in
Poa nemoralis.	*Poa nemoralis.*
Western Wolths rye-grass.	Western Wolths rye-grass.
Ratstail	Ratstail.
Canary-grass.	Canary-grass.
Danthonia pilosa.	*Danthonia pilosa.*
Danthonia semiannularis.	*Danthonia semiannularis.*
Red fescue.	Red fescue.
Hard fescue.	Sheep's fescue.
Tall fescue.	Tall fescue.
Oats.	Rib-grass.
Sheep's fescue.	Crimson clover.
Prairie-grass.	Oats.
	Yorkshire fog.

LUCERNE.

SOME RUAKURA EXPERIENCE.

No more convincing demonstration of the value of lucerne as a drought-resisting forage could be provided than that afforded by the Ruakura Farm of Instruction this season. A useful rain had not been experienced from the 24th and 25th July to the 29th January. Light showers had certainly fallen in this long interim, but they had practically no effect on the parched soil, the moisture being rapidly dissipated by the drying winds which invariably followed. The pastures, even in the usual period of maximum growth—the spring months of the year—were of poor feeding-value, and with the advent of summer they became of comparatively little use for the maintenance of stock. The 9 acres of lucerne which the farm fortunately possessed proved an effective substitute for the burnt-up pastures. For about five months 150 head of stock, of which eighty were milking-cattle, were kept in a profitable condition by feeding out the lucerne, which flourished under the unprecedented conditions. But for this the reserves of chaff would have had to be drawn upon. As it was, the drought had little appreciable effect on the profit-earning power of the stock. In addition to the dairy herds, young cattle and pigs have been fed the lucerne with the very best results, while chaffed lucerne has represented a third of the morning mash for the poultry and provided green food for the birds throughout the day. The poultry supply is taken from a flourishing plot on the poultry section, a plot which, like the field areas of lucerne, has laughed at the drought.

The Ruakura appreciation of lucerne is indicated by the fact that the area being devoted to lucerne has been increased from 9 to 26 acres. At the present time the crop of the final 9 acres is just showing up in the finely worked seed-bed.

On the principal lucerne-field—land reclaimed from a poor kahikatea swamp, a harsh pipeclay quite devoid of humus—one small portion was found to be not doing so well as the main area. After the fourth cut had been taken off the field the weed-eradicator (illustrated in the *Journal*, on page 596, June, 1914) was taken over the weak patch four times, tearing up the weeds, and disturbing the lucerne. Within a fortnight—rain having been experi-

enced in the meantime—the effect was almost magical, a fine clean growth having come away, making it difficult to believe that a few weeks before weeds were fighting the lucerne for possession of the soil.

With such a demonstration as this before them it is difficult to understand why farmers, especially in districts subject to dry spells, do not grow lucerne. If the plant does require a soil sweetened by lime, and possibly made more suitable for the purpose by the addition of inoculated soil, free of weeds, and demands special care in its initial stages of growth, the crop is a permanent one, furnishing a practically constant supply of the highest quality of feeding-material of special value when pastures and other crops fail. Where the abundance of green feed which lucerne will furnish is not required at the time it may be converted into hay, and lucerne provides the best-known material for this purpose; or it may be made into silage. In this case it is advisable to use some dry material with the lucerne—ordinary meadow-grass, or such a crop as maize at a stage nearing maturity. Thus, the farmer having a good lucerne-field may always have green food for his stock, and a supply of either the best of all hay or silage, making him quite independent of adverse weather-conditions.

CROPS FOR SILAGE.

W. DIBBLE.

In determining the class of crop to be grown for silage purposes the requirement of first importance is a crop that will give the greatest weight of feeding-material to the acre in the particular locality. There is no one best crop for silage. Maize in a district where it will thrive to perfection is probably the best of all crops for the purpose, giving, as it will under favourable circumstances, the maximum weight of forage on a minimum area of land; but there are places maybe but a few miles away where a satisfactory crop of maize cannot be depended upon or even produced. Then it would be necessary to grow such a crop as oats or tares, or rye-grass and clover. For instance, the soil and latitude may be most suitable for maize, but heavy prevailing winds would render such a weighty crop a most risky one.

Lucerne makes very valuable silage, and this can be grown in the great majority of districts; in fact, there are very few

localities where it cannot be grown, given thorough preparation of the soil in the first place and careful management in the early stages of growth. But lucerne hay is so valuable that it would be wiser to convert as much of this into hay as possible, providing it is not required for feeding out to stock, utilizing for the silo only the first cut in the spring, when the weather may put hay-making out of the question, or possibly the second cut if the weather still continues unfavourable. With silage and lucerne hay the stock-feeder would have at command a balanced ration which could not probably be surpassed, and this for all classes of stock. It would provide a complete food capable of being produced on the majority of our farms which would make the feeder independent of the more expensively produced grains and their offals. Lucerne and maize combined make a silage of exceptional quality.

Recently I had an opportunity of seeing two adjoining fields a month after they had been cut for silage. One was of lucerne and the other of rye-grass and clover. In the former case there was a second growth over 2 ft. in height, more than ready for another cut; in the latter case there was merely a good grazing bite, and a second cut for silage would probably not be secured in the season, except, maybe, if rains followed by exceptionally good growing-weather were subsequently experienced. The lucerne would probably provide four cuts this season. I have seen 40 acres of lucerne in the Clive district of Hawke's Bay reaching above my waist after only a month's growth from the second cut, although no rain had fallen during the period of this remarkable production.

Sorghum, sugar-cane, millet, &c., are all good for silage purposes, but land and environment necessary for profitable growth of these is also suitable for maize, and if maize can be successfully produced there is little to be gained in growing the other less weighty crops mentioned.

Oats and tares, rye-grass and clover, and cocksfoot, rye-grass, and clover come under a different category. These are desirable crops where such a crop as maize cannot be successfully produced. It is better to have a crop furnishing less material, providing this can be depended upon from season to season, than a crop which will only succeed in the environment under exceptional weather-conditions.

It cannot be emphasized too strongly that while silage may be made from inferior grasses, and even weeds, its feeding-value is determined by the nature of the plants from which it is made. The crop of high feeding-value gives a silage of high-feeding value,

and *vice versa*. Maize silage should be of a higher feeding-value than that prepared from meadow-grass, but the latter may easily be the better. Partially developed maize will not provide the silage that may be obtained from a high-class pasture shut up for the purpose. Good maize ensilage must be made from a well-developed crop cut when the cobs are well glazed. It is only then that it has the desired high feeding-value.

It is not always necessary to grow a crop specially for silage. Crops grown for feeding out in a green state or for feeding off may not be required for their original purpose. These superfluous supplies of fodder may well be made into silage. Thereby waste will be converted into a valuable fodder, available when it will be perhaps urgently needed.

PREPARATION OF THE SOIL.

The land should be ploughed early in the autumn, so that it can lay exposed to the rain and atmosphere during the winter months. Then cross-plough and subsoil deeply in the spring, working down to a fine tilth with disk and harrows until the seed-bed is made as fine and friable as possible. The extent to which the roller can be used at that time of the year is a matter which can only be decided at the time and on the spot. The simplest way to determine whether it is safe to roll cloddy ground is to kick the clods with one's boot. If the clods fall apart the roller may be used, but if they are difficult to break and the ground is at all moist the roller should not be employed. The roller is doing very little good if it merely forces the clods into the soil without breaking them up, for it means that a hard crust is thereby formed on the surface. Depth of cultivation, thorough preparation of the land, and a fine mellow seed-bed are all important. If water is found oozing out of the soil after a few days' rain it indicates that the land requires draining. Water-logged land, when it does dry, loses nearly the whole of its moisture by evaporation. On the other hand, the small particles in a friable soil check capillary action, and thereby prevent undue evaporation, thus remaining moist long after the sodden parts of the field have become as hard as a brick. If drainage is required it should not be neglected. It pays, and pays handsomely. Here is an experiment any one may try: Treat the land as I have indicated by ploughing in the autumn, but leave an acre and plough this up in the spring. Apply the same percentage of manure over the two areas, and seed both on the same date. The result, I am sure, will be most convincing.

WHAT CROPS TO SOW.

Maize: If maize be the plant adopted, I would recommend Red Hogan, Yellow Dent, Clarence Wonder, or Ninety Day. These have plenty of flag, and they yield a heavy weight per acre. Maize may be sown from early in November to the end of December at the rate of 1 bushel per acre, in drills 21 in. apart. It would assist the plants if the scarifier were run through the drills in the early stages of growth, to keep the soil in a friable condition, and also to check weeds. The seed can be mixed with the manure and sown through the drill. The time to harvest is when the cobs are well formed and are becoming glazed. If maize, especially in the more temperate latitudes, is to be developed to the best stage for silage—that is, when the cobs have commenced to glaze—it is necessary that the plants should be grown in drills not less than 21 in. or 28 in. apart, as only then will the necessary sunshine be admitted to properly develop the crop. In the majority of soils 5 cwt. of superphosphate and bonemeal in equal parts will be a fair manurial dressing if a really good crop is desired. The average yield of green fooder is from 20 to 45 tons to the acre.

Sorghum: This makes splendid silage on account of its richness in saccharine matter. Varieties I have proved, and which I can recommend, are—Early Amber Cane, Sorghum Imphee, Sorghum Saccaratum, and Black Sorghum. The seed should be sown about the 20th November, at the rate of 30 lb. of seed with 3 cwt. to 5 cwt. of blood and bone manure to the acre, to be drilled in with the ordinary seed-drill 7 in. apart. It is necessary to give one stroke with the tine harrow after drilling, and if the land is very dry and of a rough surface it should be rolled down. When the crop is 3 in. in height use a set of ordinary tine harrows across the drills once weekly until the crop gets too high for this to be done. An experiment may well be carried out by sowing different kinds of sorghums, and thereby testing those that are safe to use for feeding down. The time to harvest is when the crop is in full bloom. The average yield of green material is from 20 to 35 tons an acre.

Millets: The varieties I have proved to be the best are the Japanese, White French, and Pearl. Sow from 12 lb. to 20 lb. to the acre, mixed with manure, put through the ordinary seed-drill in rows 7 in. apart. The land should be harrowed across the drills, and the crop treated in the same way as sorghum. Harvest when the millet is in full bloom. Do not delay, as the seed soon forms, the crop ripening quickly. It can always be cut with reaper-and-binder. Neither maize, sorghum, nor millet stands the frosts too

well. If a frost should come out of season and turn your crops white, put the binder in at once. The average crop is from 10 to 20 tons an acre.

Clovers: The value of red clover, crimson clover, and cow-grass are well enough known. In my opinion, clover is a first-class fodder for ensilage. It is a good crop to grow, as it assists the farmer to maintain the fertility of his land. When intended for silage it should be cut when in full bloom, and conveyed to the stack as soon as possible. Do not let it get wilted by the sun.

Lucerne: Silage of a very high feeding-value may be made from lucerne. Once established this furnishes a permanent and heavy supply of material for the silo. Lucerne can be grown in any locality in the Dominion where a well-drained soil is available. It resents stagnant water and a soil that is in any way sour in condition. Even where the soil does not require draining it should be well limed—1 ton of ground limestone to the acre on strong land, using a smaller amount on lighter soils — and, if possible, soil from an established lucerne-field should be obtained and applied at the rate of 300 lb. to the acre. If weeds promise to give much trouble it is well to sow the lucerne in drills and employ intercultivation till the plants are well established. The first cut should be made just before the flowering stage. Care should be taken not to cut too near the crown. A good stimulant for lucerne on the majority of soils is basic-superphosphate, applied at the rate of 3 cwt. to 4 cwt. to the acre, with the addition of 1 cwt. of sulphate of potash on light soils. The seeding should be at the rate of 12 lb. an acre.

Last month 15 acres at the Ruakura Farm of Instruction were sown with prairie-grass and clovers, in order to give this undoubtedly valuable fodder-grass a thorough test on practical lines. — *Primrose McConnell.*

A field on the Moumahaki Experimental Farm which is the admiration of visitors this season is a 15-acre block of lucerne growing on one of the higher undulating portions of the property. Established in November of 1913 it is now the best money-making proposition on the farm. In the beginning of December the first cut was made for hay, the measured stack indicating 35 tons capacity. The second cut was obtained on the 25th January, when about 40 tons of hay were secured. Two more cuttings for hay could be probably secured this season, but owing to the dry spell the lucerne is being used at the present time in a green state.

DAIRY BULLS.

LESSONS FROM THE REGISTER OF MERIT.

W. M. SINGLETON.

THE yearly testing of purebred cows as carried on by the Dairy-produce Division has been the means of bringing certain bulls into the "limelight." Bulls which have won a reputation through daughters that are heavy producers have been subjected to the most severe test that may be exacted. More especially is this the case when these daughters are from different dams. In our Certificate of Record list we are recording the names of those bulls which have certificated daughters from at least four separate dams. After this initial requirement each bull will be entitled to credit on the performance of each and every one of his daughters qualifying for certificate.

The competition in this new class will be exceedingly interesting as well as instructive. We have even now obtained a fine nucleus to the much larger number of animals which will eventually be included in this class—a class which will at some future date represent the elite of the males of their breeds.

Various authorities have stated their opinion regarding the coefficient which is likely to represent those influences which are inherited from successive generations of progenitors. These coefficients vary with the different authorities, and many dairymen seem prepared to ignore the matter until such times as the question is settled.

Irrespective of the proportionate influence of each generation of progenitors, our records go to show that heredity does count in the breeding of dairy cows as producers. While the majority of bulls figuring in our Certificate of Record class have been imported, others have been bred in New Zealand, and we fully expect that it will not be many years before the larger proportion of our Certificate of Record bulls will be locally bred.

HOLSTEINS.

Sir de Kol Inka Pietertje.—It would naturally be expected that the bulls which show up in this respect would not be young.

Such is the case. Sir de Kol Inka Pietertje, who already has ten fully qualified daughters, was born in 1901. As a general statement this number appears very inadequate, especially when the bull's age is considered. However, this system of testing purebred cows is comparatively new, and the number of daughters is, under the circumstances, very creditable. Sir de Kol Inka Pietertje is one of the pioneer black-and-white bulls of New Zealand. Mr. Newton King, of Taranaki, with his usual perspicacity, recognized that in time Holsteins would become a popular breed in New Zealand, since they were eminently suitable to certain districts. Mr. King imported Sir de Kol Inka Pietertje and some females from U.S.A. in 1902. Later, when Mr. King desired a change of blood, this bull

SIR DE KOL INKA PIETERTJE.

was sold to the Department of Agriculture, and placed at the head of the Holstein herd at the Weraroa Experimental Farm. Some of his ten qualified daughters made their records at Mr. King's farm, and others at Weraroa.

Nazli de Kol.—Nazli de Kol, a son of Sir de Kol Inka Pietertje, bred by Mr. Newton King, appears next on our list, with a total of eight fully qualified daughters. The daughters have all been bred by Mr. Aitchison, of Kaitangata, who mated this bull with females of the Longbeach strain. The American strain in Nazli de Kol appears to have "nicked" most successfully with the Longbeach blood, as Mr. Aitchison's figures testify. The eight daughters of this bull, including four three-year-olds, one four-year-old, and three

five-year-olds, have been credited by us with productions as high as 659·30 lb. fat for a five-year-old and 644·54 lb. fat for a three-year-old, with an average of 567·68 lb. fat for the eight. Nazli de Kol is, as yet, the only bull with three daughters in the "600 lb. fat" list. Mr. Donald's champion, Netherland Princess IV, is sired by a full brother to Nazli de Kol. We hope to have something to say about him in a future issue. It remained for the semi-official testing to demonstrate the worth of Nazli de Kol. It is singularly unfortunate that the breed in New Zealand does not

NAZLI DE KOL.

possess a greater number of his daughters, as it is understood he was discarded as a sire before his period of usefulness had ceased.

JERSEYS.

Blizzard.—The Jersey bull Blizzard, owned by Messrs. O'Donnell Bros., Inaha, has seven certificated daughters to his credit. This bull evidently came to New Zealand in his dam Fury, which was imported by Mrs. F. L. Wright, Raventhorpe, Drury. Blizzard was born in April, 1903, and cannot be considered a young bull; but

the records of his daughters evidence the wisdom of his owners in retaining his services as long as possible. His best daughter, Magnet's Waif II, with a record of 604 lb. fat, is among the five Jerseys that have passed the 600 lb. fat line. Another daughter, Virginia, owned by the Curtis Estate, Inglewood, produced the creditable record of 547·43 lb. fat at the age of six years; while another daughter, Lady Blizzard II, produced 425·37 lb. fat in the three-year-old class.

BLIZZARD.

K.C.B.—One of the best-known bulls in New Zealand is Mr. E. Griffiths's K.C.B., who was born in 1901, and imported to New Zealand in 1902. For some time he was the property of Mr. George Gould, Christchurch, and was there mated with some excellent females, which gave him an opportunity to demonstrate his worth. His progeny is represented in many districts in New Zealand, the six daughters for which certificates have been issued representing as many different owners. K.C.B.'s best certificated daughter is Duchess of Lavington, owned by Mr. H. E. B. Watson, of Tai Tapu. Duchess of Lavington is one of the five Jerseys over the 600 lb. fat limit, she having a record of 600·16 lb. fat. Whinflower,

owned by Mr. F. E. Hellyer, Dunedin, comes next among the daughters of K.C.B. with a record of 514·24 lb. fat. Another outstanding record among his daughters is that of Belvedere Briar, who, while in the two-year-old class, produced 442·75 lb. fat. Mr. E. Eagle, of Belvedere, bred Belvedere Briar; and while K.C.B. was in his possession Mr. Eagle also bred from him two well-known bulls—viz., M.L.C. and M.H.R. The former has already qualified for our special bull list, while the latter has three qualified daughters. Mr. A. Moreland, of Papatoetoe, has made a very fine record of 450·38 lb. fat with Little Prim, another daughter of K.C.B.

K.C.B.

We expect to hear from more of this bull's daughters later, but the figures given above indicate something of the acquisition he has been to New Zealand.

The fact that eighty calves have been reared at the Ruakura Farm of Instruction this season without death or illness is further proof of the value of the "dry" system of rearing.

The Berkshire studs of the Moumahaki and Ruakura Experimental Farms are proving very popular throughout the Dominion. All the pigs raised meet with ready sale, stud animals having been even supplied to Australian States.

INTERPOLLINATION OF FRUIT-TREES.

ARRANGEMENTS were made last year by the Director of the Orchards, Gardens, and Apiaries Division, Mr. T. W. Kirk, for the Orchard Instructors, in co-operation with the various fruitgrowers' associations throughout the Dominion, to record observations of the interpollination of fruit-trees during the 1913 season. The reports dealing with apples are published herewith.

The particulars supplied should prove of great interest to fruitgrowers generally. The thanks of the Department are due to the fruitgrowers' associations and individual growers for their hearty co-operation.

It should be mentioned that the observations supplied in the report of Messrs. Morrison and Sons, Warkworth, refer to the 1912 season.

The name of the observer, the variety, and the flowering period are as follow:—

Variety.	Flowering Period.	Variety.	Flowering Period.
C. W. Mitchell, Whangarei.			
Gravenstein	1 Oct.–24 Oct.	Delicious	7 Oct.–27 Oct.
Springdale	24 Sept.–23 Oct.	Etowah	12 Oct. – 4 Nov.
John Toon	25 Sept.–27 Oct.	Yates	1 Oct.–27 Oct.
"	25 Sept.–25 Oct.	Sharp's Late Red	4 Oct.–24 Oct.
Scarlet Pearmain	25 Sept.–24 Oct.	London Pippin	29 Oct.–27 Nov.
Commerce	1 Oct.–24 Oct.	Golden Pippin	1 Oct. – 4 Nov.
Gladney's Red	25 Sept.–27 Oct.		
J. W. Collard, Orchard Instructor, Whangarei.			
Sharp's Late Red	7 Oct.–26 Oct.	Sharp's Late Red	7 Oct.–25 Oct.
Springdale	28 Sept.–30 Oct.	Golden Pippin	3 Oct. – 1 Nov.
Gravenstein	3 Oct.–27 Oct.	"	5 Oct. – 2 Nov.
Lord Wolseley	8 Oct. – 2 Nov.	"	1 Oct. – 2 Nov.
Sharp's Late Red	9 Oct.–29 Oct.	Monroe's Favourite	5 Oct. – 1 Nov.
F. Morrison and Sons, Warkworth.			
Yates	5 Oct.–27 Oct.	Kentucky Redstreak	6 Oct.–26 Oct.
Golden Pippin	4 Oct.–24 Oct.	Purity	6 Oct.–27 Oct.
Scarlet Pearmain	10 Oct.–29 Oct.	Wellington Pippin	8 Oct.–27 Oct.
London Pippin	15 Oct.–12 Nov.	Warner's King	11 Oct.–28 Oct.
Lord Wolseley	12 Oct. – 4 Nov.	Twenty Ounce	10 Oct.–30 Oct.
Winesap	12 Oct. – 1 Nov.	Cleopatra	4 Oct.–24 Oct.
Glowing Coal	14 Oct. – 3 Nov.	Red Astrachan	1 Oct.–21 Oct.
Ethel	12 Oct. – 1 Nov.	Monroe's Favourite	3 Oct.–23 Oct.
Eliza Rathke	12 Oct. – 1 Nov.	Jonathan	9 Oct.–29 Oct.
Crisp's Russet	8 Oct.–28 Oct.	Ecklinville Seedling	6 Oct.–22 Oct.
Trdika	19 Oct.–11 Nov.	New Rock Pippin	12 Oct.–30 Oct.
Cooper's Market	17 Oct. – 6 Nov.	Prince Alfred	3 Oct.–23 Oct.
Coldstream Guards	14 Oct. – 4 Nov.	Takapuna Russet	8 Oct.–28 Oct.
Sharp's Early	28 Sept.–18 Oct.	Wealthy	10 Oct.–27 Oct.
Boston Russet	8 Oct.–28 Oct.	Rymer	7 Oct.–27 Oct.
Edmund Jupp	10 Oct.–25 Oct.	New England Pigeon	5 Oct.–27 Oct.
Fall Pippin	6 Oct.–26 Oct.	Allsopp's Green	7 Sept.–26 Sept.
Gogai Pippin	8 Oct.–26 Oct.	Pride of Australia	2 Oct.–24 Oct.
Pioneer	4 Oct.–25 Oct.	Sharp's Nonesuch	8 Oct.–27 Oct.
Lord Suffield	9 Oct.–29 Oct.	Proctor's Seedling	30 Sept.–18 Oct.
Lord Nelson	5 Oct.–20 Oct.	Mr. Bryan	10 Oct.–28 Oct.
Keswick Codlin	8 Oct.–28 Oct.	Hay's Midseason	5 Oct.–24 Oct.

Variety.	Flowering Period.	Variety.	Flowering Period.
E. Morrison and Sons, Warkworth—continued.			
Edward Lippiatt	4 Oct. –24 Oct.	Domoine	1 Oct. –24 Oct.
Climax	10 Oct. –26 Oct.	Arabskoe	8 Oct. –31 Oct.
Ben Davis	10 Oct. –26 Oct.	Gloria Mundi	9 Oct. –27 Oct.
American Golden Russet	1 Oct. –24 Oct.	Red Cluster	1 Oct. –22 Oct.
Irish Peach	29 Sept.–28 Oct.	Shepherd's Perfection	3 Oct. –25 Oct.
Mobb's Royal	6 Oct. –26 Oct.	Gem	7 Oct. –25 Oct.
Sturmer Pippin	2 Oct. –22 Oct.	Salome	9 Oct. –26 Oct.
Summer Strawberry	1 Oct. –25 Oct.	Frampton	1 Oct. –18 Oct.
Reinnette du Canada	5 Oct. –26 Oct.	McMahon's White	1 Oct. –19 Oct.
Red Quarrenden	3 Oct. –23 Oct.	Gravenstein	5 Oct. – 4 Nov.
Cliff's Seedling	29 Sept.–19 Oct.	Siberian Bitter-sweet	10 Oct. –28 Oct.
Commerce	7 Oct. –26 Oct.	Horn	5 Oct. –26 Oct.
Traveller	8 Oct. –27 Oct.	Colonial Washington	8 Oct. –26 Oct.
Red Majestic	6 Oct. –29 Oct.	Yellow Newtown Pippin	8 Oct. –28 Oct.
Paragon	8 Oct. –28 Oct.	White Winter Pearmain	1 Oct. –21 Oct.
Niedwetz Kiana	29 Sept.–22 Oct.	Smith's Cider	10 Oct. –26 Oct.
McIntosh's Red	6 Oct. –25 Oct.	Red Bietigheimer	9 Oct. –26 Oct.
King David	12 Oct. –28 Oct.	Wolf River	6 Oct. –24 Oct.
Early Rivers	6 Oct. –26 Oct.	Allington Pippin	5 Oct. –26 Oct.
Bramley's Seedling	6 Oct. –26 Oct.	Champion	6 Oct. –26 Oct.
Antonowka - Polowora-fountowaia	5 Oct. –20 Oct.	Diadem	7 Oct. –24 Oct.
Willie Sharp	28 Sept.–20 Oct.	Grannie Smith	1 Oct. –21 Oct.
Winter Strawberry	5 Oct. –23 Oct.	Korobowka	1 Oct. –20 Oct.
Draper's Best	10 Oct. –28 Oct.	Lady Carrington	20 Sept.–12 Oct.
Mr. Gladstone	8 Oct. –28 Oct.	Yellow Bellflower	30 Sept.–28 Oct.
Rokewood	7 Oct. –28 Oct.	Majorie Hay	24 Sept.–14 Oct.
Hockett's Sweet	7 Oct. –26 Oct.	Mona Hay	19 Sept.–10 Oct.
Celline	11 Oct. –29 Oct.	Thorle Pippin	26 Sept.–20 Oct.
Wagner	5 Oct. –23 Oct.	Gannon Grove	21 Sept.–17 Oct.
Bismarck	6 Oct. –26 Oct.	Early Richmond	23 Sept.–12 Oct.
Ashmead's Kernel	5 Oct. –26 Oct.	Magg's Seedling	8 Oct. –28 Oct.
Hall	26 Sept.–16 Oct.	Cox's Orange Pippin	10 Oct. –30 Oct.
Baldwin	5 Oct. –25 Oct.	Court-Pendu-Plat	23 Oct. –14 Nov.
Sharp's Late Red	8 Oct. –28 Oct.	Emperor Alexander	13 Oct. –31 Oct.
Winterstein	2 Oct. –21 Oct.	French Crab	11 Oct. –31 Oct.
Stayman Winesap	8 Oct. –29 Oct.	Maverack's Sweet	14 Oct. – 3 Nov.
Reinnette Baumann	13 Oct. –31 Oct.	Ruby Pearmain	10 Oct. –30 Oct.
Rhodes Orange	3 Oct. –26 Oct.	Stone Pippin	8 Oct. –28 Oct.
Romanite	2 Oct. –25 Oct.	Winter Majeten	20 Oct. – 9 Nov.
Gladney's Red	1 Oct. –27 Oct.	Early Joe	4 Oct. –22 Oct.
Betty Geeson	3 Oct. –26 Oct.	Late Scarlet	3 Oct. –23 Oct.
Williams's Favourite	11 Oct. –27 Oct.	Jenkins's Seedling	5 Oct. –25 Oct.
Duchess of Oldenburg	3 Oct. –27 Oct.	Thomas Rivers	4 Oct. –20 Oct.
Brownlee's Russet	3 Oct. –22 Oct.	Scarlet Queen	30 Sept.–20 Oct.
Wheeler's Russet	3 Oct. –22 Oct.	Signe Tillisch	5 Oct. –26 Oct.
Late Shell	10 Oct. –30 Oct.	Red Spy	13 Oct. – 7 Nov.
Dougherty	1 Oct. –22 Oct.	Wellsford Seedling	8 Oct. –28 Oct.
Frivett's Seedling	5 Oct. –21 Oct.	Lady Hopetoun	16 Oct. – 6 Nov.
Hames's Red	11 Oct. – 2 Nov.	Lady Sudeley	6 Oct. –26 Oct.
Ballarat Seedling	7 Oct. –27 Oct.	Cornish Gilliflower	6 Oct. –26 Oct.
Delicious	4 Oct. –22 Oct.	Rambourg de Winnitza	11 Oct. –30 Oct.
Springdale	1 Oct. –22 Oct.	Hambling's Seedling	14 Oct. – 5 Nov.
Hamilton	8 Oct. –26 Oct.	Fall Beauty	14 Oct. – 3 Nov.
John Sharp	6 Oct. –24 Oct.	Rome Beauty	13 Oct. – 2 Nov.
Fanny	6 Oct. –26 Oct.	Yarra Bank	15 Oct. – 4 Nov.
Black Ben Davis	10 Oct. –26 Oct.	Golden Queen	4 Oct. –24 Oct.
George Neilson	29 Sept.–20 Oct.	Hoover	16 Oct. – 5 Nov.
Taupaki	29 Sept.–17 Oct.	Epp's Seedling	11 Oct. –31 Oct.
Carlton	10 Oct. –28 Oct.	Buncombe	9 Oct. –29 Oct.
Senator	8 Oct. –26 Oct.	Etowah	6 Oct. –26 Oct.
Nero	8 Oct. –26 Oct.	Clenango Strawberry	10 Oct. –28 Oct.
Lord Roberts	3 Oct. –20 Oct.	Northern Spy	13 Oct. – 7 Nov.
H. MacCormick, Papakura.			
Irish Peach	2 Oct.– 9 Oct.	Sturmer Pippin	13 Oct.–20 Oct.
Red Astrachan	4 Oct.–17 Oct.	Pomme de Neige	15 Oct.–25 Oct.
Gravenstein	9 Oct.–18 Oct.	New York Pippin	9 Oct.–18 Oct.
Peasgood's Nonesuch	4 Oct.–14 Oct.	Monroe's Favourite	18 Oct.–25 Oct.
Horn	4 Oct.–11 Oct.	Five Crown Pippin	22 Oct.–31 Oct.
White Winter Pearmain	2 Oct.– 9 Oct.	Northern Spy	22 Oct.–31 Oct.
Etowah	4 Oct.–15 Oct.	Falwin	27 Oct.– 6 Nov.
Shepherd's Perfection	4 Oct.–15 Oct.		
J. A. Cruickshank, Tuakau.			
Cleopatra	27 Sept.– 6 Oct.	Adams's Pearmain	12 Oct. –17 Oct.
Commerce	28 Sept.– 8 Oct.	Northern Spy	14 Oct. –22 Oct.
Aromatic Russet	29 Sept.– 5 Oct.	Sharp's Late Red	12 Oct. –19 Oct.
Gravenstein	1 Oct. –19 Oct.	Rome Beauty	19 Oct. –27 Oct.
Springdale	3 Oct. – 9 Oct.	Lord Wolseley	19 Oct. –28 Oct.
Monroe's Favourite	6 Oct. –12 Oct.		

Variety.	Flowering Period.	Variety.	Flowering Period.
T. E. Rodda, Orchard Instructor, Hamilton. (*Observed at Whangamarino.*)			
Braddick's Nonpareil	23 Sept.–20 Oct.	Dougherty	30 Sept.–28 Oct.
Northern Spy	27 Sept.–28 Oct.		
T. E. Rodda, Orchard Instructor, Hamilton. (*Observed at Te Kauwhata.*)			
Summer Golden Pearmain	21 Sept.–12 Oct.	Willie Sharp	23 Sept.–16 Oct.
C. McLiver, Puriri.			
Astrachan	22 Sept.– 6 Oct.	Yates	1 Oct. –16 Oct.
Northern Spy	11 Oct. –24 Oct.	Gravenstein	7 Oct. –19 Oct.
Sturmer Pippin	27 Sept.–14 Oct.	Shockley	1 Oct. –16 Oct.
McLiver's Winesap	10 Oct. –22 Oct.	Warner's King	5 Oct. –18 Oct.
F. C. Bull, Kaiti, Gisborne.			
Ballarat Seedling	30 Sept.–30 Oct.	Apple of Commerce	29 Sept.–20 Oct.
McIntosh's Red	1 Oct. –24 Oct.	Cox's Orange Pippin	8 Oct. –31 Oct.
Delicious	3 Oct. –24 Oct.	Rome Beauty	9 Oct. – 7 Nov.
Gravenstein	3 Oct. –29 Oct.	King David	10 Oct. –27 Oct.
Sturmer	30 Sept.–31 Oct.	Garibaldi	29 Sept.–24 Oct.
Etowah	30 Sept.–25 Oct.	Irish Peach	27 Sept.–15 Oct.
J. C. Hardy, Patutahi, Gisborne			
Ballarat Seedling	28 Sept.–25 Oct.	Ribston Pippin	17 Sept.–21 Oct.
Monroe's Favourite	21 Sept.–23 Oct.	Gladstone	30 Sept.–19 Oct.
Hair Bros., Patutahi, Gisborne.			
Jonathan	20 Oct.–30 Oct.	Scarlet Pearmain	15 Oct.–20 Oct.
Sturmer Pippin	20 Oct.–30 Oct.	Irish Peach	15 Oct.–20 Oct.
Dougherty	20 Oct.–30 Oct.	Gladstone	15 Oct.–20 Oct.
Cox's Orange Pippin	20 Oct.–30 Oct.	Winter Pearmain	15 Oct.–20 Oct.
Rhodes's Orange	15 Oct.–20 Oct.	Sharp's Improved	15 Oct.–20 Oct.
Allington Pippin	15 Oct.–20 Oct.	Sharp's Early	15 Oct.–20 Oct.
Rome Beauty	15 Oct.–20 Oct.		
A. M. Robertson, Mahora.			
Springdale	20 Sept.–20 Oct.	Esopus Spitzenberg	28 Sept.–20 Oct.
Lord Wolseley	10 Oct. –30 Oct.	Rymer	28 Sept.–20 Oct.
Sturmer Pippin	1 Oct. –20 Oct.	Stirling Castle	3 Oct. –25 Oct.
Jonathan	1 Oct. –20 Oct.	Delicious	3 Oct. –20 Oct.
Gravenstein	28 Sept.–13 Oct.	Dougherty	2 Oct. –18 Oct.
Mrs. A. M. Randall, Greenmeadows.			
Reinnette du Canada	1 Oct. –28 Oct.	Romanite	28 Sept.–18 Oct.
Dougherty	28 Sept.–25 Oct.	Ballarat Seedling	3 Oct. –23 Oct.
Scarlet Pearmain	28 Sept.–25 Oct.	Jonathan	3 Oct. –25 Oct.
Adams's Pearmain	1 Oct. –25 Oct.	Monroe's Favourite	1 Oct. –22 Oct.
Lord Wolseley	8 Oct. –30 Oct.	Five Crown Pippin	10 Oct. –30 Oct.
Symonds's Winter	1 Oct. –21 Oct.	Sturmer Pippin	2 Oct. –23 Oct.
F. Cook, Hastings.			
Jonathan	6 Oct. –18 Oct.	Commerce	29 Sept.–12 Oct.
Cox's Orange Pippin	6 Oct. –18 Oct.	Baldwin	4 Oct. –18 Oct.
Gravenstein	29 Sept.–12 Oct.		
W. F. Wishart, Pakowhai.			
Dougherty	1 Oct. –18 Oct.	Jonathan	7 Oct. –23 Oct.
Rokewood	3 Oct. –20 Oct.		
S. Watson, Havelock North, H.B.			
Pomme de Neige	27 Sept.–11 Oct.	Sturmer Pippin	28 Sept.–12 Oct.
Ross Nonpareil	27 Sept.–11 Oct.	Dougherty	28 Sept.–12 Oct.
Jonathan	28 Sept.–15 Oct.	,,	28 Sept.–16 Oct.
,,	28 Sept.–15 Oct.		
W. T. Benefield and Sons, Aramoho.			
Brown Russet	30 Sept.–18 Oct.	Reinnette du Canada	30 Sept.–18 Oct.
A. H. Benefield, Wanganui East.			
Sturmer	23 Sept.–15 Oct.	Reinnette du Canada	10 Oct. –31 Oct.
Jonathan	30 Sept.– 6 Oct.	Cox's Orange	4 Oct. –31 Oct.
Russet	17 Sept.–12 Oct.	Ribston Pippin	28 Sept.–23 Oct.
Washington	2 Oct. –31 Oct.	Delicious	5 Oct. –31 Oct.
Rymer	12 Oct. – 9 Nov.	Rome Beauty	15 Oct. – 5 Nov.
Adams's Pearmain	5 Oct. –31 Nov.		
F. W. Smith, Kai Iwi, Wanganui.			
Boston Russet	20 Sept.–13 Oct.	Cox's Orange Pippin	26 Sept.–13 Oct.
Sturmer Pippin	25 Sept.–15 Oct.	Reinnette du Canada	30 Sept.–20 Oct.

Variety.	Flowering Period.	Variety.	Flowering Period.
F. H. Outram, Palmerston North.			
Irish Peach	13 Sept.– 1 Oct.	Cox's Orange Pippin	27 Sept.–20 Oct.
Sturmer Pippin	27 Sept.–20 Oct.	Stone Pippin	27 Sept.–20 Oct.
Washington	27 Sept.–20 Oct.	Winter Majetin	10 Oct. –30 Oct.
Dillington Beauty	27 Sept.–20 Oct.	Reinnette du Canada	10 Oct. –30 Oct.
J. Jones, Palmerston North.			
Sturmer Pippin	27 Sept.–15 Oct.	Ballarat Seedling	1 Oct. –27 Oct.
Shepherd's Perfection	27 Sept.– 8 Oct.	Winter Majetin	7 Oct. –30 Oct.
Keswick Codlin	27 Sept.– 8 Oct.	Northern Spy	8 Oct. –29 Oct.
Dougherty	28 Sept.–13 Oct.	Five-crown Pippin	9 Oct. – 1 Nov.
Cox's Orange Pippin	1 Oct. –16 Oct.	Baldwin	7 Oct. – 2 Nov.
Reinnette du Canada	1 Oct. –23 Oct.	Jonathan	29 Sept.–17 Oct.
Shailer and Son, Hokowhitu Orchard, Palmerston North.			
Irish Peach	8 Sept.–24 Sept.	Red Quarrenden	25 Sept.– 9 Oct.
Jonathan	23 Sept.–10 Oct.	Stone Pippin	29 Sept.–12 Oct.
Cox's Orange Pippin	25 Sept.–15 Oct.	Lord Suffield	27 Sept.–10 Oct.
Adams's Pearmain	20 Sept.– 9 Oct.	Alfriston	1 Oct. –17 Oct.
Washington	23 Sept.– 9 Oct.	Gravenstein	22 Sept.– 7 Oct.
Sturmer Pippin	23 Sept.–12 Oct.	Northern Spy	29 Sept.–15 Oct.
Reinnette du Canada	27 Sept.–15 Oct.		
James Remnant, Ngatimoie.			
Jonathan	6 Oct. –17 Oct.	Scarlet Pearmain	4 Oct. –17 Oct.
Cox's Orange Pippin	4 Oct. –14 Oct.	King David	8 Oct. –17 Oct.
Sturmer Pippin	4 Oct. –14 Oct.	Esopus Spitzenberg	6 Oct. –17 Oct.
Monroe's Favourite	1 Oct. –14 Oct.	Worcester Pearmain	9 Oct. –18 Oct.
Rokewood	1 Oct. –14 Oct.	Lord Wolseley	9 Oct. –18 Oct.
Washington	1 Oct. –14 Oct.	Epp's Seedling	4 Oct. –18 Oct.
Rymer	3 Oct. –14 Oct.	Loy	9 Oct. –17 Oct.
York Imperial	7 Oct. –17 Oct.		
Thomas C. C. Scott, Stoke.			
Jonathan	25 Sept.–25 Oct.	Commerce	4 Oct. – 5 Nov.
Sturmer Pippin	1 Oct. –25 Oct.	Rome Beauty	4 Oct. –25 Oct.
Delicious	1 Oct. –30 Oct.	Rokewood	25 Sept.–22 Oct.
Senator	4 Oct. –25 Oct.	Adams's Pearmain	25 Sept.–25 Oct.
Foster	4 Oct. –25 Oct.	Cox's Orarge Pippin	25 Sept.–22 Oct.
Dougherty	10 Oct. – 5 Nov.	Lord Wolseley	10 Oct. – 5 Nov.
E. B. Izard, Stoke.			
Golden Reinnette	3 Oct. –24 Oct.	Sturmer Pippin	28 Sept.–20 Oct.
Jonathan	26 Sept.–11 Oct.	Keswick Codlin	25 Sept.–20 Oct.
Allington Pippin	29 Sept.–15 Oct.	Mobb's Royal	23 Sept.–15 Oct.
Cleopatra	28 Sept.–15 Oct.	Epp's Seedling	25 Sept.–18 Oct.
Leslie Reynolds, Stoke.			
Monroe's Favourite	23 Sept.– 1 Oct.	Gravenstein	16 Sept.–28 Sept.
Duchess of Oldenburgh	28 Sept.– 8 Oct.	Cox's Orange Pippin	28 Sept.– 8 Oct.
Washington	26 Sept.– 2 Oct.	Epp's Seedling	28 Sept.– 8 Oct.
Cardinal	26 Sept.– 6 Oct.	Jonathan	16 Oct. –24 Oct.
Nonpareil Russet	26 Sept.– 6 Oct.	London Pippin	12 Oct. –20 Oct.
Springdale	26 Sept.– 6 Oct.		
G. W. Anderson, Papanui.			
Jonathan	26 Sept.–15 Oct.	French Crab	4 Oct. –20 Oct.
Monroe's Favourite	28 Sept.–17 Oct.	Lord Wolseley	11 Oct. –24 Oct.
Sturmer	4 Oct. –20 Oct.	Rome Beauty	17 Oct. –29 Oct.
W. Rhodes, Akaroa.			
Sturmer Pippin	1 Oct. –13 Oct.	Kentish Fillbasket	7 Oct. –21 Oct.
Ribston Pippin	29 Sept.–12 Oct.	Lord Wolseley	11 Oct. –25 Oct.
Yorkshire Greening	3 Oct. –16 Oct.	Rome Beauty	18 Oct. –31 Oct.
Nonpareil Russet	3 Oct. –16 Oct.		
Waigth and Sons, Roxburgh.			
Cleopatra	28 Sept.–11 Oct.	Dunn's Favourite	25 Sept.–12 Oct.
French Crab	28 Sept.–13 Oct.	Adams's Pearmain	26 Sept.–14 Oct.
Jonathan	29 Sept.–13 Oct.	Scarlet Nonpareil	28 Sept.–12 Oct.
Newton Pippin	26 Sept.–14 Oct.	Ribston Pippin	29 Sept.–12 Oct.
Sturmer	30 Sept.–14 Oct.	Cox's Orange Pippin	2 Oct. –16 Oct.
Stone Pippin	28 Sept.–16 Oct.		
T. J. Burnet, Woodend.			
Sturmer	23 Sept.–21 Oct.	Lord Wolseley	24 Sept.–28 Oct.
Jonathan	25 Sept.–23 Oct.		
J. A. Stirling, Waimahaka.			
Winter Pearmain	10 Oct. – 3 Nov.	Bramley's Seedling	12 Oct. –23 Oct.
Lord Grosvenor	10 Oct. –28 Oct.	The Queen	6 Oct. –26 Oct.
Sturmer Pippin	27 Sept.–24 Oct.	Cox's Orange Pippin	9 Oct. –30 Oct.
Yorkshire Greening	8 Oct. –27 Oct.	Blenheim Orange	9 Oct. –31 Oct.
Peasgood's Nonesuch	28 Sept.–30 Oct.	Quarrenden	8 Oct. –22 Oct.

FRUIT-CULTURE.

THE TREATMENT OF CLAY LANDS.

W. K. DALLAS.

THE matter which is brought before the notice of the fruit-growers of the Dominion in this article is not by any means new, but, unfortunately, in many cases it does not receive all the consideration by orchardists to which it is entitled. With the large annual extensions to the area already under fruit in Tasmania and other of the Commonwealth States, it follows that competition in the future will be much more keen than it is at present. It is therefore essential that we should guard against overlooking any particular that would prevent us from producing a maximum quantity of first-grade with a minimum of second-grade and inferior fruit.

Every one is aware that to secure the finest results healthy growth is essential. In order to obtain the best return from the trees in the orchard it is necessary we should understand something of the

COMPOSITION OF THE SOIL.

As a considerable quantity of our fruit is grown on land with a clay subsoil and a heavy surface soil the elements of this class of soil may be considered.

In the first place, all soils were originally formed from rocks. The subsoil is that condition in the process of decomposition between the rock and top soil. It differs from the rock, but the changes it has undergone have not advanced far enough for the production of true soil. At this stage of transition we have a mineral matter—clay. Clay is made up of very minute particles which adhere to one another. The chemical composition of these is silica, together with a substance known as alumina. Water also enters into the formation of all natural clays. Pure clay from a chemical point of view is useless as a source of plant-food; but clays are always more or less impure, inasmuch as they generally contain such elements essential to the nutrition of plants as potassium, iron, calcium, and magnesium. When water falls upon a clay surface it accumulates in puddles, and water that becomes

lodged in the interstices of clay has very little tendency to drain away, thus causing the surface to become muddy. Soil consisting entirely of clay would be very cold, damp, and firm.

The gradual change from rock to soil continues, and in the course of time we have what we term a clay soil, which is composed of organic matter — containing nitrogenous compounds and humus—the result of the decay of vegetable and animal matter.

As one of the constituents of a soil, clay has many valuable properties, among the most important being that it retains water, and so keeps the soil moist, condenses the oxygen from the air, and gives tenacity to the soil. In addition to the foregoing, its absorptive and retentive powers in regard to plant-food, such as ammonia, potash, lime, and phosphoric acid, resulting from the decomposition of manures, is most valuable.

DRAINAGE.

Drainage is essential to the healthy growth of all vegetation. It is possible for the cultivator to exercise some control over the moisture in the soil by suitable drainage and cultivation. These matters, on land such as we have just been considering, should receive the fullest consideration of every agriculturist, whether he be an orchardist or a grain-grower.

CULTIVATION.

To till the soil, and to till it well, is a primary condition of success in agriculture.—FREAM.

The culture of heavy land which is intended for orchard purposes should be begun at least two years before the trees are planted.* Owing to the deficiency of humus in a clay soil, it must be patent to every one that such land on being broken up for the first time would not be in the best condition to receive young trees. In order to increase the supply of humus the ground should be lightly ploughed, disked, harrowed, and then sown with a leguminous crop, which when sufficiently far advanced should be ploughed in deeply, and the upturned surface left to fallow until towards the end of summer, when the ground should be cross-ploughed and cultivated. Another crop should be sown, and in due course ploughed in, as was the former one. Previous to planting in the following autumn the land should be worked up

* Whilst this is certainly desirable it is not always necessary. Experience with some of the clay lands of New Zealand goes to show that the trees may be first planted and the humus crop, grown between the lines of trees, may be ploughed in during the first or second year.

to a fine tilth. I would here advise those starting out without previous experience not to attempt to cultivate the land while it is in a wet condition. Following the autumn planting the land should be ploughed away from the trees in the spring, and brought down to a fine state by disking, scarifying, and harrowing. This should be followed by regular summer cultivations with the scarifier.

The annual cultivation of the land really commences at the beginning of winter. At the first winter ploughing the soil should be thrown towards the tree, so that any excess of water may run down the "finish" in the centre of the lands, and not over the roots, as would be the case if the soil were thrown from the trees. At the second and spring ploughing the land should be thrown from the trees.

In the middle of the lands the plough should be set at a depth of 6 in. or 7 in., and when close to the trees should be reduced to 3 in. or 4 in.

Summer cultivation keeps the soil in a suitable condition for the roots, assists in absorbing and retaining the moisture in the soil, and is also useful, through the action of the air, in sweetening the land. In summer, and particularly in a dry one, the retaining of moisture in the soil is important.

Without thorough pulverization the moisture would rise by capillary attraction to the surface of the soil, where it would be evaporated, and thus be lost to the trees. Under cultivation the capillary force is broken when it has passed through the subsoil. The moisture, which is continually rising to the feeding-layer of earth, not only supplies the moisture required by the trees, but also dissolves the plant-food in the soil, and so makes it available for absorption by the roots. The demand for moisture by the trees at this time of the year is higher than at any other period, for, in addition to increased respiration through the leaves, there is the water required for the fruit. In Australia, where the climate is considerably drier and warmer than it is in this country, summer cultivation is not neglected in the orchards.

Conservation of the water in the soil in dry summers by means of cultivation is a matter that requires the attention of every agriculturist. A green crop should be sown in the later summer, and turned under at the winter ploughing. It is not advisable to grow any crop other than that intended for green-manuring. It should be borne in mind that the trees are the crop, and that everything else is of secondary importance.

During the past few years implements for the cultivation of the orchard have been very much improved, and are designed

for the carrying-out of complete and thorough cultivation at a minimum of cost.

The space remaining uncultivated by horse implements around the trees should not by any means be overlooked. This space should be carefully cultivated with a plantation hoe, every care being taken not to injure the roots. A hoe is preferable to a spade, because with the latter the tendency is to go rather deep. A point I would emphasize is that cultivation as practised generally around the trees is too deep. I know of instances where the ground has been cultivated deeper around the tree than it has been in the middle of the lands. What is the result of such a practice? It must be apparent to every one that the water was drained to the roots of the trees instead of away from them. Picture the condition of the soil surrounding the roots in a heavy land such as we have under consideration in the winter and spring months. To use an American expression, the trees would be suffering from the effects of "wet feet." The reason why many trees are not doing so well as is expected of them is simply because of improper cultivation as indicated above. I would strongly advise all commercial and domestic growers to look to this matter at once and see if they are not making the same mistake in their own orchards. Under such conditions it is impossible for the trees to thrive as they should do. An unhealthy tree cannot produce fruit of good quality nor fruit in any quantity.

Mr. W. S. Hill, B.Agric., Horticulturalist and Plant-breeder of the Moumahaki Experimental Farm, has resigned from the Government service. He has relinquished educational work to become a working-farmer, having decided to manage a family property in the Pukekohe district, Auckland, where he proposes to keep in touch with experimental farm-work and provide practical demonstrations of the commercial value of the principles advocated as the result of the work of himself and others at Moumahaki. The use of lucerne as a dominant farm crop must, in consequence of his experience at Moumahaki, be a feature of Mr. Hill's objective—to prove the money-making power of intensive methods. Before leaving Moumahaki Mr. Hill was entertained by the farmers of the district, when they presented him with a gold watch as an appreciation of the services he had rendered them. The Moumahaki Farm hands gave Mr. Hill at the same time a gold albert, and the Manager contributed a gold sovereign-case. The learners on the farm gave him a bridle. Mr. Hill's work at Moumahaki will be continued in the meantime by Mr. J. Beverley, a gentleman who has had considerable experience in plant-breeding work in Great Britain.

HONEY FOR EXPORT.

STORING AND GRADING ARRANGEMENTS.

T. W. KIRK.

THE Department has ascertained that the following stores will be available for the storage and grading of honey intended for export during the approaching shipping season, also that the charges enumerated will be made to shippers by the owners of the stores:—

The New Zealand Express Company's store, Auckland.

The New Zealand Co-operative Honey-producers' Association's store, Normanby.

The Wellington Meat Export Company's store, Wellington.

The Lyttelton Harbour Board's store, Lyttelton.

The Timaru Cold Stores and Ice Company's store, Timaru.

Agricultural Department's store, railway-yard, Dunedin.

When forwarding honey, shippers are asked to advise the Government Grader, care of the Department of Agriculture, at any of the following places as the case may be: Auckland, Wellington, Christchurch, Dunedin.

The terms of storage, &c., at the different stores are as follow: New Zealand Express Company, Auckland, charge 8d. per case. This includes cartage from ship or rail to store and receiving, one week's storage, opening cases for grading and closing, cartage to ship. The New Zealand Co-operative Honey-producers' Association, Normanby, make cartage, receiving and delivering, storage, &c., free of charge to consignors who are members of the association. A charge of 8d. per case will be made to non-members of the association. The Wellington Meat Export Company charges 8d. a case. This includes receiving at store, opening and closing cases for grading purposes, storage for one month or part of month, and delivery from store. Honey stored for more than one month will be charged at the rate of 2d. per case for each succeeding month or part of month. Cartage to and from store is not included in above. The Lyttelton Harbour Board: Receiving at store, 1s. per ton or portion of ton; delivery at store, 1s. per ton; storage, 1s. per ton per week or fraction thereof. The above charges cover all

handling necessary in opening and closing cases for grading, loading honey into railway-wagons, and consigning same to ship's side. The Timaru Cold Stores and Ice Company, Timaru, charge 8d. a case. This includes cartage, receiving, opening and closing cases for grading purposes, storage for one month, and delivery from store. Honey stored for more than one month will be charged at the rate of 2d. per case for each succeeding month or part of a month. The Department's store, railway-yard, Dunedin, charges 8d. a case, to include receiving at store, opening and closing cases for grading purposes, storage for one month or part of a month, and delivery from store. Honey stored for more than one month to be charged at rate of 2d. per case for each succeeding month or part of month.

The storekeeper at each of the above stores will collect from the shippers the above charges before goods are delivered out of store after grading. In all other respects the procedure of last season will be followed.

MOUMAHAKI EXPERIMENTAL FARM.

THOUGH the Moumahaki Experimental Farm has just passed through one of the driest seasons in its history, the 550 acres of available land is carrying at the present time 400 head of cattle, 500 sheep, 100 pigs, and 45 horses. There are 40 acres in root and forage crops and 50 acres in lucerne. Thirty-eight acres have been cropped. Of this area 20 acres in wheat have yielded a crop estimated to thresh 60 bushels to the acre. Oats were grown on 5 acres, the yield being calculated at 65 bushels. Barley was grown on 3 acres, a 70-bushel crop being secured. Eight acres were under oats and vetches, mixed, which should give a profitable return. In addition to this, about 100 tons of lucerne and 100 tons of meadow hay have been saved. It is estimated that 250 tons of lucerne have been carted out to the stock from the first cutting in the spring to the end of February. From the 1st December 50 acres of the rougher area of the property (the gullies) have been closed up, to furnish winter grazing and shelter for stock. At the present time all the stock on the property is in excellent condition, though considerable difficulty has been experienced in providing drinking-water for the cattle and horses. The good crops of the season secured under the unfavourable climatic conditions are no doubt due to the settled policy of the property of green-manuring (to provide the light soil with the necessary humus) and thorough cultivation.

DAIRYING IN SWITZERLAND.

CHEESEMAKING AND CITY MILK-SUPPLY.

W. WRIGHT.*

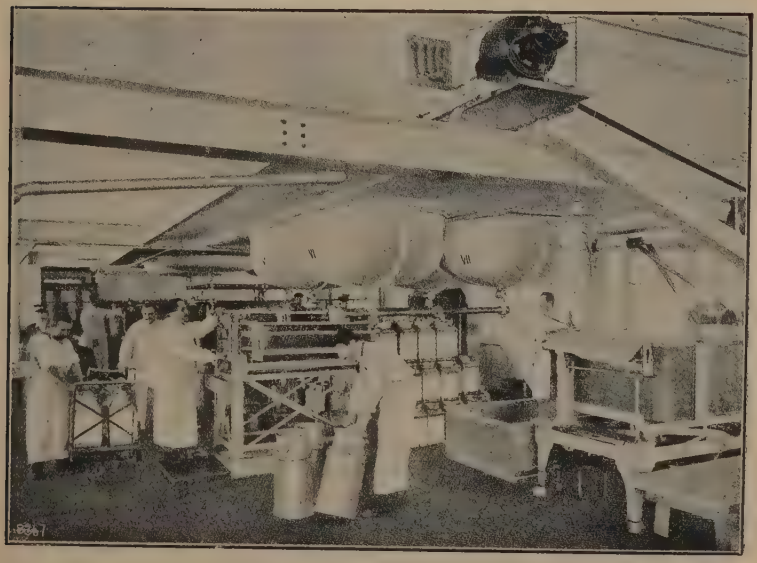
THE business of cheesemaking in Switzerland is conducted on quite original principles, and its investigation was one of the most instructive features of my work of investigating the dairy industry of Switzerland.

One of the most important cheese centres is at Gossau. Here I saw the export-cheese warehouse of Messrs. Siegenthaler and Co. This is a private firm of cheese-factors, whose business was established in 1867. Their last season's export of cheese amounted to £40,000. This firm enters into agreements with farmers to buy their cheese at the age of two months, on a six-months agreement. A fixed price is agreed upon for what we would term first-grade cheese, and any cheese of poor quality is taken at a price to be agreed upon by the parties concerned. Emmental and Gruyere cheese is exported by the firm to the U.S.A. and Continental countries. The cheese-barrels and scale-boards are made in the firm's own factory, the cost of the barrels being about 2s. 6d. each. There is storage-room for about 5,000 large cheese in the cellars, where the curing of the cheese is continued after leaving the dairy or factory in which it was made.

The cheese-factories of Albertswil, Arnegg, Haupt, and Laubach, which are situated not far from Gossau, were also visited. Leaving these, a run of about seven miles and a half brought us to the Thurgovie Canton, and a visit was paid to the large cheese-factories of Amriswil and Lilschlacht. The general practice here is for the farmers to co-operate and build the factory and piggeries. The buildings are then rented to a cheesemaker, who buys the farmers' milk for cheesemaking purposes. The cheesemaker also owns the pigs, and it is worthy of note that the fattening of pigs plays a great part in the operations of nearly every cheese dairy or factory in eastern Switzerland. The cheesemakers reserve to themselves the whey, after the cheese is made, for pig-feeding purposes. Pigs are grown and fattened on a ration of whey and crushed grain. It is estimated that the number of pigs sold fat from the several cheese-factories visited runs to about 3,500 to 4,000 yearly. A visitor is much impressed by the apparent crowding of the pigs in some of the pens at the Arnegg factory I counted twenty-seven pigs of

* Inspector of New Zealand Dairy-produce in London.

THE MAIN BUILDING.



THE MILK-RECEIVING DEPARTMENT.

about 140 lb., live weight, in one pen, and there were twenty-four such pigs in the building. The pigs, however, appeared to be quite healthy, and the sties kept clean. The selling-weight for pigs in this locality is from 220 lb. to 230 lb. each. All the factories are substantially built of stone and brick; the piggeries are in close proximity to the cheese-factories, being built of the same materials. The cost of erecting the buildings and plant at Amriswil was about £5,000, and that of the smaller factories in proportion. The daily milk-supply of the various factories visited runs between 4,000 lb. and 9,000 lb., and the price paid is between 8d. and 9d. per gallon, irrespective of fat-content, for reasons that I have stated earlier in this report.

Returning via Zurich, Mr. Ruddick and I decided to spend a few hours at that city, sufficiently long to enable us to visit the large and well-appointed milk-depot established by the late Dr. Gerber for supplying the citizens of Zurich with pure milk. This milk-supply depot at Zurich is regarded as being one of the best, if not the best, of its kind in the world. The following particulars are translated from information supplied by the manager of the company:—

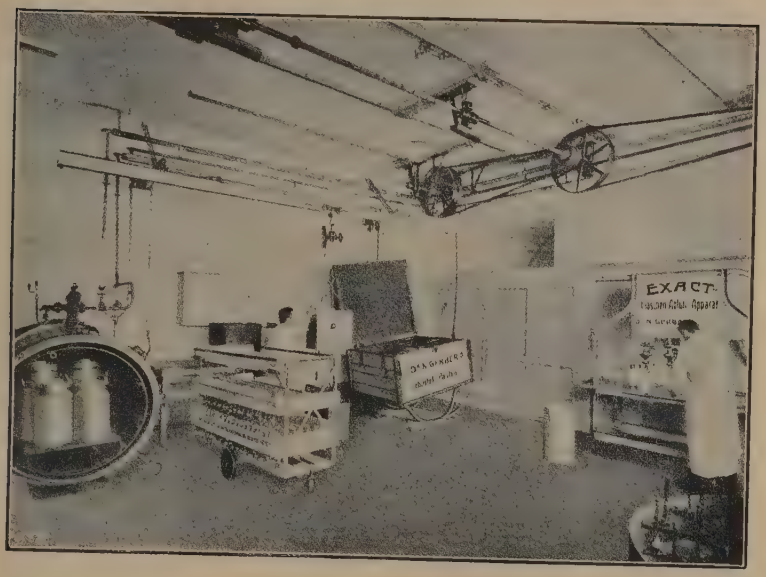
A MODEL CITY MILK-SUPPLY BUSINESS.

The object of the Vereinigte Zurcher Molkerein Und Schweizerische Kefir und Yoghurt Anstalt, a concern formed by the fusion of the former dairy business of Dr. N. Gerber (established in 1887), the Zurcher Central-Molkerei (established in 1889), and the Schweizerische Kefir Anstalt Axelrod (established in 1883), is to supply the inhabitants of Zurich and the neighbourhood with a, hygienically speaking, perfect unskimmed milk and first-class milk-products, as well as to assist in rendering more sanitary and improving the milk-conditions of the Town of Zurich.

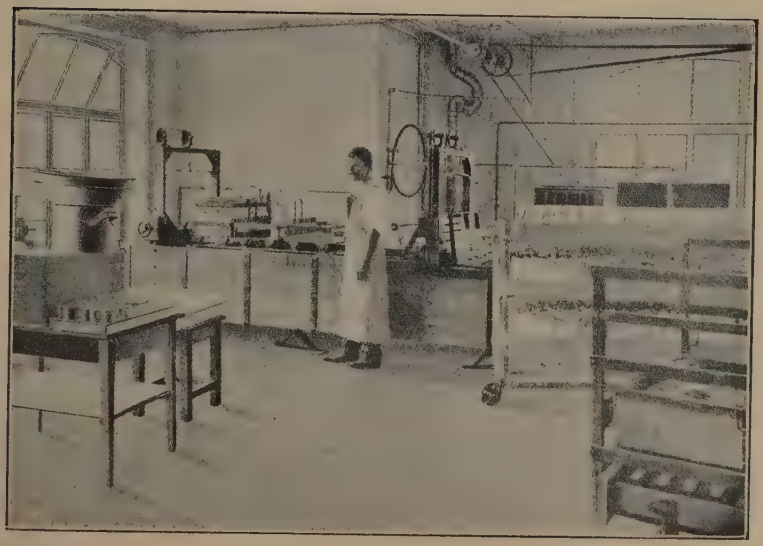
It was on the 1st October, 1887, that the late Dr. N. Gerber opened the first dairy business in Zurich, and it may be mentioned here that he was a pioneer in the provision of a better and more rational supply of milk to the Town of Zurich. The whole of his influence was directed towards having the sale of the so-called market or skimmed milk suppressed. As the Town of Zurich increased its population and extended its boundaries the problem of supplying it with milk became an increasingly difficult one, as the area from which the supply was drawn had to be ever further extended. The demands of the Health authorities and of the public are constantly increasing, so that it is only a large concern working on rational lines that is able to satisfy all requirements. The dairy establishment, which is equipped with all the most up-to-date technico-scientific appliances, is to-day in a position to cope with a daily demand of up to 50,000 litres (10,000 gallons) of milk. The concern has its own veterinary and its own chemist, and offers all the guarantees which can be demanded of a town dairy establishment, in so far as a thorough service and hygiene are concerned. The daily milk-supply, which in the autumn of the year 1909 amounted to about 30,000 litres (6,000 gallons), already stands to-day at about 40,000 litres (8,000 gallons), a proof that the work and the efforts of this dairy establishment are meeting with ever increasing recognition on the part of the inhabitants of Zurich. The milk-consumption of Zurich works out, according to statistics, at ⅘ litre a head a day, which gives a total of about 130,000 litres (26,000 gallons). To deal with this service, the establishment employs at the present time 170 hands. It has, moreover, at its disposal 55 horses and 75 carts.

The dairy building is so arranged that an abundance of air and light finds its way everywhere. To pass to the individual departments, we will here mention the following:—

1. The large milk-hall, with appliances for taking in, cleaning, cooling, storing, and distributing the milk, with a mechanical can- and lid washing plant.
2. The sanitary-milk department, with pasteurizing and sterilizing apparatus.
3. The milk-treating rooms, with centrifugal plant, cheesemaking plant, and installation for making butter, cream, &c.
4. The butter-hall.



THE PASTEURIZING-ROOM.



WHERE THE MILK IS BOTTLED.

5. The department for the manufacture of specialities, such as kefir, yoghurt, dry preparations, &c.

6. The cheese-store.

7. The cooling plant, with ice-making installation, various cooling-rooms, and underground cooling-cells.

8. Engine-house, with electric motor, steam-engine, steam plant, and accumulator.

9. Office accommodation (management, working-manager's office, pay-office, and general offices).

10. Two milk-testing laboratories.

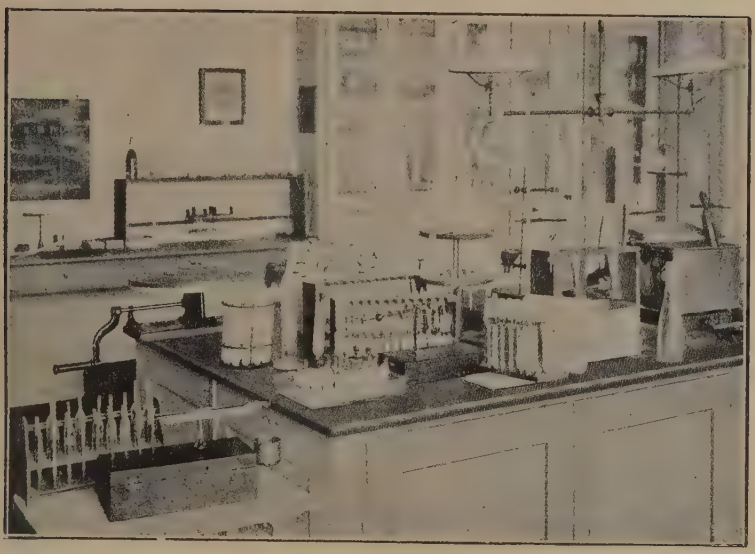
11. Various workshops for tinsmiths, mechanics, painters, cartwrights, and saddlers.

12. Washing and ironing room.

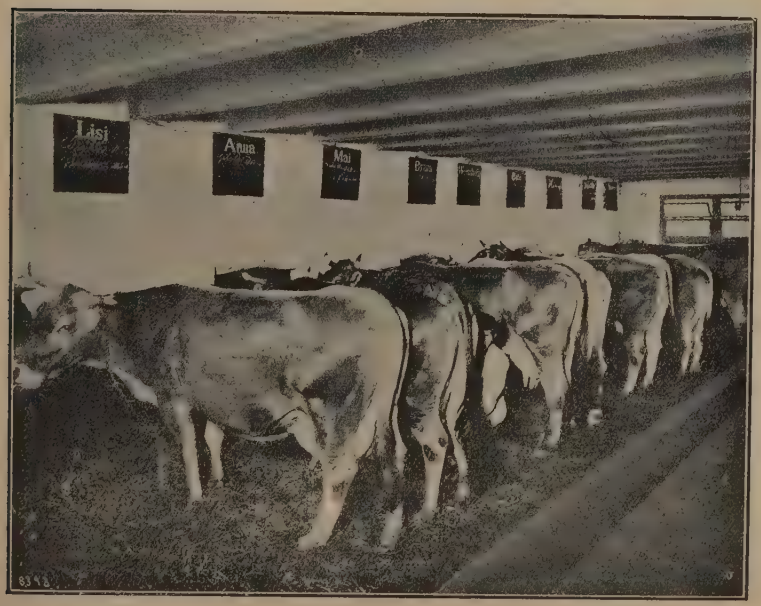
13. Stabling.

14. Selling-premises.

To obtain an approximate idea of this dairy business, the best plan will be to accompany the milk from the point at which it is produced to the point of distribution to the consumer. Our instructions lay down that only milk of unaltered quality, such as is obtained by regular, uninterrupted and thorough milking from sound cows, rightly fed, is to be supplied. The greatest attention must therefore be paid to the obtainment of the milk at the point of production. To this end, our own veterinary has to examine the state of health of all animals yielding milk several times a year. Careful supervision is, moreover, exercised over the milking staff, the feeding and treatment of the animals, the housing-conditions, the milking and transport vessels, and all the milk-collecting centres. In the year 1913 milk was regularly supplied to the Vereingte Zurcher Molkerein by thirty-eight alpine dairy associations and three individual producers from 6,323 cows in 1,326 stalls. The milk-supply area lies outside the Town of Zurich, and extends to a maximum distance of 25 kilometres, and is in the vicinity of large lines of communication, a circumstance which renders it possible to have the milk readily delivered at the dairy establishment. As soon as obtained, the milk is conveyed to the various collecting-centres, where a special receiving official is responsible for the immediate filtration and cooling of the milk. Here, also, it is of great importance to exercise strict supervision over the delivery of the milk coming from each individual purveyor. A chemist is charged with the duty also of making surprise visits to these collecting-centres as often as possible, in the morning or evening, for the purpose of taking samples of the milk supplied by all purveyors. These samples are then tested in the milk-testing laboratory by the most up-to-date methods, for the purpose of determining their quality. Should the milk be found to be poor in quality, diseased, or adulterated, samples are taken in the stalls in order to ascertain the causes of such abnormalities. Purveyors of adulterated milk are brought by us before the Courts, while those supplying diseased milk or milk which is poor in quality must be eliminated as purveyors. The amount of impurities contained in all the samples of milk taken is always determined, and is very frequently the cause of complaint, and in this connection it is a matter of great satisfaction that of late the official laboratories of Zurich have had the purveyors of impure milk punished. From the collecting-centres the whole of the milk is conveyed, mostly by railway, in special wagons to Zurich, and from there to the dairy establishment. Here, also, samples are again regularly taken from each of the cans for examination. After weighing, the milk is freed, in two Heine cleaning centrifugal machines, from whatever impurities it may still contain, whereupon it is cooled to from 5 to 8 degrees Centigrade by means of two large flat coolers, and then mixed in large milk-holders of a capacity of from 2,500 to 5,000 litres (500 to 1,000 gallons). Several samples from each holder must be analysed in the milk-testing laboratory before the milk is distributed. Milk is delivered twice a day, while distribution takes place twice in summer and once in winter, an arrangement which ensures a supply of constantly fresh, good-keeping, and uniform-quality milk to the inhabitants of Zurich. Seventy-five milk-carriers with seventy-five hand and horse-drawn carts convey the milk to the house customers in the town and suburbs of Zurich, as well as to about eighty depots in every quarter of the town. The cans in which the milk is transported are conveyed, as soon as they are emptied, to the mechanical can-washing plant, where they are immersed in hot soda-water, scrubbed inside and outside, and finally subjected to a thorough cleaning with steam and water. After they have been cleaned they are sent back again by railway to their place of destination, ready to receive the next supply of milk.



THE LABORATORY.



INTERIOR OF A TYPICAL COW-SHED

Now that we have surveyed the arrangements for the general milk business, we will first of all direct our attention to the sanitary-milk department. Here the *vorzugsmilch* (prime milk), which is supplied to us from two model establishments, is filled into bottles and then pasteurized by Dr. N. Gerber's shaking pasteurizing process. Special instructions govern the obtainment and treatment of this *vorzugsmilch*. Amongst other arrangements, the cows supplying it are examined as to their state of health by the veterinary at least every month. Animals reacting to tuberculin are eliminated as suppliers of sanitary milk. In addition to the foregoing, sanitary milk, which is particularly suited to serve as a food for children and invalids, is subjected to a special chemico-biological examination by the chemist. Under the sanitary-milk department there are the milk-treating rooms. According to requirements part of the milk arriving is here treated with a view to the obtainment of cream, butter, or cheese. There is here also a milk-heater installed, by means of which, in the event of an outbreak of contagious diseases, the whole of the milk may, in case of need, be heated with a view to destroying any germs that may be present in it.

We now reach the well-lighted and airy butter-hall, fitted out with white slabs, which serves at the same time as a centre for the sale of other milk products and specialities. Adjoining this hall are the cheese-cellars, where the various kinds of cheese intended for current consumption are stored. The more extensive cheese-stores of the establishment are fitted out on the ground floor of the former central establishment.

We will now proceed to the engine-house, and will mention here, first of all, the cooling plant. The great importance of cold in connection with dairy-work is a matter of general knowledge. It is indispensable for the manufacture and supply of first-class products and for the hygienic supply of milk. This cooling plant, of a capacity of 6,000 calories an hour, serves primarily for cooling the milk, though also for the making of ice and for the cooling of three cooling-cells and two special underground cooling-cells. The power required for working purposes is supplied by a 60 horse-power electro-motor, together with various smaller motors. In the engine-room there are, furthermore, mounted the steam and warm-water plant, a reserve steam-engine, and the accumulator plant with charging installation. The rooms for making specialities, such as kefir, yoghurt, dry preparations, &c., are fitted out, separate from the other working-premises of the establishment, on the second floor. It is in these well-lighted and clean rooms that our milk-specialities, which are in such general demand, are prepared with the exercise of every care.

We now reach in our tour of inspection the extensive office premises, comprising the management, working-manager's office, the book-keeping department, the pay-office, and the general supervision office. Adjoining these premises are the two large milk-testing laboratories. In a chemico-physical laboratory and a bacteriological laboratory separate from the former the milk and its products are subjected to a conscientious scientific analysis. This department offers every guarantee for the, hygienically speaking, perfect quality of all the products which the firm deals in. All the auxiliary concerns are established away from the dairy, properly so-called, and are splendidly equipped. Passing through the workshops of the smith, painter, and cartwright, we enter the tinsmith's shop, where we see how every imaginable kind of vessel is repaired and tinned afresh. A master mechanic and electric fitter see, moreover, to the upkeep of the engines and the lighting plant. The auxiliary arrangements comprise also a washing plant and a drying-room. Opposite the dairy there is a stable building with accommodation for twenty-five horses, together with a shed for sheltering various carts.

As can be gathered from the foregoing, such a dairy establishment is an extremely complicated concern, which, to work properly, requires, as does scarcely any other business to the same extent, a most reliable personnel. The business must not break down in all the 365 days of the year, and must work as reliably as the postal service, a railway, the telegraph service, &c. Its efforts are constantly directed towards supplying consumers with none but the best milk and with first-class dairy-products.

Any one may visit this milk-supply establishment by giving notice in advance, and people are invited to do so.

WHEATS INTRODUCED BY THE DEPARTMENT.

THE following newspaper extracts are specially interesting by reason of the fact that the varieties of grains mentioned were introduced by the Department :—

Some varieties of wheat of recent introduction seem to have proved of no small merit in a dry season, whatever may be their worth under favourable or normal conditions. At any rate, we have heard of a small area of Red Marvel having threshed out an average of 50 bushels per acre, this being by several bushels an acre the largest average recorded so far in North Otago. The achievement is made more noteworthy by the fact that other varieties growing contiguously to the newcomer gave much smaller returns than it did. The berry of the Red Marvel is large and of good colour, and it is said to be a good wheat for gristing purposes. Another wheat of recent introduction that is reported to have withstood the absence of moisture well is Dreadnought, but we have not heard of any actual yields from it this harvest.—*Oamaru Mail.*

At Te Moana, near Geraldine, Mr. R. Hammond has for some years past cultivated a number of Government experimental plots, which have been specially manured and devoted to different kinds of cereals, mostly new varieties, the seed being provided by the Agricultural Department. This season no such plots have been set aside, but Mr. Hammond has utilized some of the seed that was harvested from last year's plots. In this way he sowed 14½ chains with Prohi White wheat, which stood the season exceptionally well, and was not beaten down by wind or rain. The yield from the area was 77 bushels. Another variety, McCallum's Solid-straw Autumn, was sown on an area of 9½ chains; but this wheat was a good deal broken down by the storms, but threshed out 53 bushels from half a chain less than an acre. A half-acre area was devoted to Dreadnought, which returned 24 bushels— equal to 48 bushels to the acre. A similar area was devoted to Yandilla King, which yielded 19 bushels. The main wheat crop on Mr. Hammond's farm consists of Red Marvel and Red Chaff, but this has not yet been threshed, though it is expected to yield 60 bushels to the acre. Of oats, Mr. Hammond sowed 2½ bushels of Green's Ruakura, which has yielded 63 bushels. All the areas were fertilized with basic slag at the rate of 2 cwt. per acre. Mr. Hammond is generously giving seed of the varieties he has tested in order that it may be sold for the benefit of the Belgian Fund.—*Christchurch Press.*

IF you are going to sow wheat on land now in grass, skim-plough at once. Wheat does not do its best on land newly ploughed out of grass.

GROW LUCERNE

A MARLBOROUGH farmer made £12 a week off twelve acres of lucerne for a period of six weeks during one period of the present season by grazing stock. He had also taken two crops of hay off the twelve acres by the end of January and expects to obtain two more crops of hay by the end of the season.

LUCERNE.

CO-OPERATIVE FIELD TRIALS IN THE NORTH ISLAND.

G. DE S. BAYLIS.

THE first trials of lucerne in the North Island by farmers co-operating with the Department of Agriculture were made in 1909, and several of the experimental plots are still in existence. Since these trials were initiated about five hundred tests of lucerne have been undertaken by farmers in all parts of the North Island under the co-operative experiment system, whereby the Department supplies the seed and manure and instructions regarding the preparation of the land, while the farmer pledges himself to carry out those instructions to the very best of his ability, and finds all the labour necessary, and fencing if any is required. In addition to the plots actually undertaken under this co-operative system a very large number have been put in by the farmers themselves at their own cost, the co-operative experiment officers giving by letter full instructions as to the preparation of the land as regards manuring, cultivation, and subsequent treatment. Many visits to various farms and districts have also been undertaken in cases where difficulties had arisen, in order to make investigation on the spot. The results of the co-operative trials of lucerne have been not only to permanently establish plots of lucerne throughout the North Island, but to afford instruction at the same time as to the various methods which can be utilized in order to prepare the land for this crop. The co-operative trials have also been a means of investigating which classes of soil in the North Island are best adapted to the growing of lucerne, while they have also gathered considerable information about the treatment required by soils of less suitable nature in order to fit them for lucerne.

With regard to the classes of soils on which lucerne will grow, these co-operative trials have clearly established the fact that it will grow on a very large variety of soils provided the land is properly prepared for it.

The class of soil on which it grows most readily, and often without any special preparation of the land at all as regards lime, manure, and inoculation, are the rich alluvial soils which are not of too stiff a nature. The most difficult and most expensive soils

on which to establish lucerne are undoubtedly the clays. When preparing soils for lucerne, to the majority an application of lime is advantageous, and to many absolutely essential. It should be applied in the form of fine ground limestone to all soils of a light nature not over well supplied with organic matter. The bulk of the lime should be preferably applied to the land a full season before the ground is required for the lucerne, and it will become better distributed throughout the total depth of the soil if the amount to be put on is divided into two lots and applied at separate ploughings.

On the lighter and more porous classes of soils it has been found advantageous to plough under a green crop some considerable time before the land is required for lucerne, in order to supply more humus to the soil and to allow sufficient time to elapse for the soil to become fairly compact again thereafter. An early sown autumn crop of oats and vetches answers the purpose well, and affords some return in the meantime by way of winter feed, the second growth being reserved for ploughing under.

On clays and compacted silts and stiff alluvial soils it may be sometimes necessary to supply a certain amount of artificial drainage, and with these soils also the ploughing-under of a green crop assists to keep the soil open and more porous, in addition to its manurial value. On some soils considerable difficulty has been met with in the poverty of the subsoil, and here by subsoiling, liming, and artificials successful results have been obtained. In order to deal with soils of this class a subsoiling tool has been fitted to a lever-plough, and a manure-box similarly fitted to the plough, which will lime and fertilize the subsoiled area at the same time as it is being ploughed. In this way the ploughing, subsoiling, liming, and application of artificials, if required, to the subsoil are done in one operation and by the same plough.

Soils in the North Island which will grow lucerne practically without any special preparation of the soil or the use of lime or fertilizers are limited. The principal reasons of failure met with amongst those who have sought for information after having attempted unsuccessfully to grow lucerne have been generally attributable to one or other of the following causes:—

Attempting to grow lucerne on land in which the winter water-level was within about 3 ft. of the surface, or less.

Omitting to apply lime, or applying it only at the time of seeding.

Omitting to plough under a green crop on light lands.

Omitting to use fertilizers.

Sowing lucerne on land which was full of weed-seeds.

Omitting to use inoculated soil on new lands requiring it.

Sowing on too loose a seed-bed.

Covering seed too deeply.

Omitting to harrow lucerne in order to cripple the weeds as soon as the young lucerne-plants were strong enough to stand it.

On older stands leaving the lucerne to fight the weeds instead of using the cultivator to assist it in getting the better of them.

The majority of farmers are in too great a hurry to sow lucerne after once having made up their mind to try it, whereas on many soils it would be wiser to hasten slowly.

For a medium soil of fairly good quality, but which requires deepening, liming, fertilizing, and inoculating, the following is an easy and cheap method to pursue :—

Plough in early autumn, lime, and sow down a green crop for winter feed, such as oats and vetches, using a judicious quantity of fertilizer, which should contain a certain percentage of slow-acting phosphates, much of which will have action in the soil for a considerable period. The first growth to be used as green feed, the second growth to be ploughed under to a good depth, and a temporary pasture sown down, consisting chiefly of Italian rye with from 3 lb. to 5 lb. of lucerne-seed mixed with it. This crop for preference should be kept grazed or cut and never allowed to seed. It should remain on the ground till the following spring, or longer if necessary, when it should be ploughed under, and the land prepared for lucerne by further liming, manuring, and inoculation if found necessary.

The following extracts are taken from a few of the many reports received :—

Masterton, Walter Cameron (21st February, 1915).—Sown 1911. Lucerne standing well. I take three cuttings yearly, and could easily get four. I graze it with lambs after last cutting. For hay it stands out on its own.

Rewa, J. Powell.—Gave it a good harrowing in early spring. Came away splendidly. Cut for hay. Two weeks afterwards put fifty lambs on 1½ acres : in three weeks thirty went away fat. Weather very dry, paddocks quite burnt up. Lucerne green and luscious. Crop eighteen months old.

Rapanui, W. J. Cooper.—Did not cut newly sown plots of lucerne on sand-hills. Turned in about 150 sheep. Nearly all are away fat. Have harrowed land well. Am so pleased with lucerne I intend to keep going till I have 50 acres in.

Tiritea Valley, A. Mason.—Sown December, 1914. Height on uninoculated plot 2 in., on inoculated plot 2 ft.

Feilding, J. McFarland.—I commenced growing lucerne on half an acre eight years ago. Crop proved successful throughout, and is as good this year as ever. Have averaged four heavy crops of hay each year, and a certain amount of green feed. This year I cut some lucerne from Government plots measuring 3 ft. 10 in. Have now 6 acres in lucerne. It is invaluable for keeping up the milk-supply. It has no equal for hay or green feed.

Awahuri, R. Ross.—There is no other forage to touch it for its nutrient value and rapidity of growth. This year it started to grow in October, and grew at the rate of 2 ft. per month.

Palmerston North, J. A. McLeavey.—Sown 27th December, 1911. Varieties : New Zealand, Peruvian, and Turkestan. New Zealand proved superior to the

others and gave four cuts the first year. Turkestan came next. This is the best thing I have ever yet tried.

Marton, G. L. Marshall.—Sown 16th November, 1911. Second year's growth much improved by top-dressing. The crop has given two good cuts, and is nearly ready for a third. Growth is much stronger than in the first year.

Feilding, H. Booth.—Sown 10th November, 1908. In the spring following I contemplated ploughing up the crop, the weeds having almost taken possession. Instead I disked thoroughly. Three or four good cuttings were obtained the same season. Hay cut off these plots obtained first prize at the Palmerston North Winter Shows in 1913 and 1914.

Makuri, W. J. Taylor.—Sown 17th November, 1911. Lime and inoculated plot was the best. Inoculated was next. The crop has done fairly well considering the exposed situation.

Rongomai, W. B. Matheson.—Sown 1913. The crop was cut several times, and also grazed several times. A very satisfactory stand was secured.

Rongokokako, B. Morris.—Sown November, 1912. Plot is looking very well and healthy. The estimated weight of the two previous cuttings is between 6 and 7 tons of hay.

Patea, W. Arundell.—23rd February, 1915. Plot sown 12th November, 1912. Uninoculated portion was inferior to inoculated for full twelve months. During first season the crop was cut twice, on 4th March and 30th April. Total weight, 9 tons 19 cwt., 108 lb. of green material. During the second season it was cut five times—viz., in September, November, January, February, and April. The total weight was 47 tons 2 cwt. 10 lb. of green material.

Inaha, H. Batten.—The original plot is still in existence and is a success. I have now 6 acres in lucerne. Lucerne has a great future before it.

Stratford, J. Walsh.—In spring, 1914, I grazed the crop lightly with cows, and later on shut it up and cut about 5 tons of hay on the 1st January. Since 16th February I have again been cutting and feeding to cows. It stands in the front rank as a milk-producer. I give the plot a good tine-harrowing after each cutting.

Okaiawa, R. Johns.—The lucerne-plot is an absolute success. It was sown 7th November, 1913, and cut twice during that season. It was grazed in spring, cut 20th December, and again in January. We have sown another 1½ acres this season. As a forage lucerne is invaluable.

Midhirst, R. Savage.—My plot is a great success. I cut it green in November and fed to cows. In February I cut 2 tons of hay per acre, and grazed it afterwards. I consider there is nothing better.

Okaiawa, H. Betts.—This crop is the best thing for either hay or green feed that I have ever known.

Lepperton, J. N. Blackhall.—Sown 10th November, 1914. I cut on 25th January 9 tons 10 cwt. of green material. I am very pleased with the crop. The second growth for about twenty-five days is 15 in.

Hawera, J. Fitzgerald.—The crop has done fairly well considering the dry weather, since it was only sown in the spring. I am putting in another acre next season, and another the following one.

Stratford, R. Mounsey.—Sown October, 1914. I cut for mulch in January. Inoculated land has a stronger and better growth. I consider the plot a success.

Tarata, Blackbourne Bros.—Sown 17th November. Cut three times. Lime and manures gave 33½ cwt. per acre. Inoculated soil and manures gave 47 cwt. per acre. Lime, inoculated soil, and manures gave 65¾ cwt. per acre. No manure gave 40½ cwt. per acre.

Normanby, J. Were.—Sown 10th October, 1911. I cut twice the same season: the second time in February, 1912, when 2 ft. high. It has received very close attention. It has an excellent colour and a good root-growth.

Takaora, H. E. Johnson.—Sown 7th December, 1912. Plot worked with cultivator and harrows at intervals until free from weeds. Owner has sown down this season several additional acres.

Alton, H. Schultz.—Sown 30th November, 1911. Fed down by twelve cows on four occasions: on the 12th to 29th October, when 2 ft. 4 in. high; on 25th November to 7th December, when 2 ft. 6 in. high; on the 13th to 25th March, when 2 ft. high; and in April for five days, when 5 ft. high. In December, 1912, the growth was 28 in. high in twenty-six days.

Alton, C. Amos.—Sown 30th November, 1911. Cut three times the first season. The second season it was looking exceptionally well all over. Six crops obtained in this, the third season.

Norsewood, F. Escreet.—We have only had one slight shower since it was sown. On 19th February had a very heavy white frost which did not effect the lucerne. Have every faith in lucerne doing well in this district. Am preparing 3 acres to sow in the spring.

Dannevirke, J. A. Riddell.—Plot without manure, lime, or inoculated soil failed. Off the balance—viz., ¾ acre—I cut about 8 tons for hay after it was heavily stocked all winter. Am in the drought-stricken area of Hawke's Bay, and in my opinion lucerne stands unrivalled.

Raumati, J. Hart.—Should estimate the yield at about 35 tons green fodder per acre. I had five cuts off my plot last season.

Wairoa, S. H. Dickie.—Plot still in existence and doing well. Have cut plot three times and expect easily to get a fourth cutting. Grass is very bare and dry, but lucerne grows vigorously. Dry weather does not affect it in the least. Growth this year was from 2 ft. to 2 ft. 6 in. in four weeks. Put a spring-tooth cultivator over it after second cutting. It seemed to do it a lot of good.

Hastings, R. Wilson, jun.—Sown 25th November, 1911. Lime and inoculated plot best. Lime plot next.

Wairoa, W. Mackay.—Sown 31st October, 1913. Medium pumice on grey subsoil. Ploughed out of grass. Plot with manure and inoculated soil fairly good. Other plots hardly show any sign of lucerne.

Wairoa, J. Powdrell.—Sown 1913. Rooted over 4 ft. Good stand secured. Intend extending area every year.

Opotiki, W. Sydenham.—Cut three times. First cut gave 9 tons 6 cwt. green, second cut 9 tons 16 cwt., third cut 7 tons. Cows are giving more milk. Expect to easily get five cuttings this season.

Matata, H. Cuff.—Unlimed plot an absolute failure. Uninoculated plots did not do as well as inoculated plots, but are recovering. Grazed with cows in spring. Closed for hay 9th December. Cut about 2 tons hay, 3rd February, per acre. Grazed again with cows. Shut up for seventeen days, by which time lucerne was again 12 in. high. Am firmly convinced it is going to establish itself permanently, although till recently was very dubious about its success. Intend putting in 2 or 3 acres next spring. Marked increase in milk whenever cows are put on lucerne. Feel firmly convinced these light pumice lands will in lucerne equal the richest dairying lands in New Zealand in ordinary pasture. Am very grateful to the Department for putting me on the right track, as I have tried to grow lucerne here for the last seven years unsuccessfully. Lime is one of the keys to solution in this district.

Matata, T. Parkinson.—I took two cuttings of green feed off and then grazed the crop several times during autumn and winter. It is absolutely the best crop a farmer can grow for dairying or stock. Get the land scrupulously clean and in good heart. The better the land the better the stand.

Roto Orangi, F. Paine.—Sown 30th November, 1912. Three cuttings were obtained. This season again three cuttings. Eminently suited to the district.

Raglan, E. M. Harsant.—The soil here consists of a black top-soil and a heavy yellow clay subsoil. The plot was sown in January, 1912, and has been an unqualified success in spite of the abnormally dry season.

Gisborne, Dr. Cole.—The paddock was sown at the end of October, 1914, and the crop grew 15 in. tall within three months. It was then cut, and grew 12 in. in twelve days. I have followed the Department's instructions *re* preparation of land.

Ongarue, S. Knight.—The soil is a light pumice. The crop was sown in November, 1912, and is very much in existence. It was of pale colour the first season, and did not cut half as much hay as cow-grass did. It has been fed off lightly every winter, and considerable weight of green feed has been cut in autumn as well as hay. I have now 6 acres in lucerne. Lucerne is of the very highest value in pumice soil. I saw a little cow-grass with it, which grows well the first two seasons, but the third year it seems expended, while lucerne is well established. The lime used on this soil should be the carbonate, not burnt.

Clevedon, S. A. Browne.—My plot on gravel was a success. I cut it at the end of October, and it was fit to cut again in six weeks. I wish I had had it long ago.

Otorohanga, J. Lawson.—Sown 1912. I have finished cutting for the third time. Crop 2 ft. high. I intend putting in 6 acres next season.

Waikino, F. Geck.—Sown November, 1914. There was slow growth the first three weeks, but there has been rapid growth ever since. I cut on the 14th January. Crop grew 5 in. before I got the hay off the paddock. Cut again

18th February. Am putting in a few acres next season, and am going to double the quantity of your manures, as I do not think the Department uses enough manure. Soil, sandy loam on a sandy subsoil.

Matamata, J. W. McCaw.—Inoculated portion a success; non-inoculated did no good. Plot treated with 13 cwt. ground limestone, 4 cwt. basic super, 1 cwt. kainit per acre. Inoculated has done best from the start. Last autumn I disked and tine-harrowed, and top-dressed with 4 cwt. slag. Have cut twice, and got 2 tons hay each time. Last autumn grazed for a time with calves, which did well on it. Intend putting down 5 acres this coming season.

Helensville, C. C. Osmond.—Sown 1914. Considering the dry season, I got a good take, and plot looks right. With rain am confident it will be a success. Is fit to cut now.

Kumeu, P. Boucher.—Sown 1912. Dry swamp gum land. My experience is, the more it is cultivated and harrowed the better it thrives. Stands drought. Grows freely and very much more rapidly than cow-grass. Hope to have 10 acres of it soon.

Manurewa, F. D. Clayton.—As to the value of lucerne as a forage, there is nothing to come up to it. My cows always go up in milk when they get it. I intend putting down additional acres next year.

Frankton, W. Duffus.—Sown 10th November, 1912. Cut three times: 10th January, 1913, when 7 in.; 17th February, when 18 in.; and 26th April, when 15 in. Troubled much by weeds. Killed most of them. Tine-harrowed after cutting. Extremely pleased with result of trial. Propose to plant 10 acres next season.

Piriaka, A. E. Anderson.—September, 1912. Plot with lime and soil the best. Lime only next best. Mr. Anderson is very pleased with result, and intends extending crop next season.

LIST OF LUCERNE TRIALS UNDERTAKEN UNDER CO-OPERATIVE SYSTEM.

Auckland, Season 1910–11.—Butler, J. M., Opotiki; Wilson, —, Te Puke; Boucher, P. A., Kumeu; Yeoman, F. C., Oparau. *Season 1911–12.*—Lowe, W. H., Otorohanga; Anderson, A., Piriaka; Wilson Bros., North Wairoa; Butler, J. M., Opotiki; Hall, W. T., Pirongia; Knight, S., Ongarue; Murray and Sons, Opotiki. *Season 1912–13.*—Riddell, C. O., Te Puke; Lurman, H. A., Otorohanga; Masters, A. W., Pukepoto; Ferguson Bros., Otorohanga; Boucher, P. A., Kumeu; Norris, G. T., Cambridge; Turnbull, M., Frankton Junction; O'Connor, D., Te Kowhai; Cooper, W., Otorohanga; Smythe, P. F., Bay of Islands; Shepherd, M., Kaeo; Jones, J. W., Pukaraka; Ivey, H., Pukaraka; Bromley, H., Hikumutu; Stanton, S., Mangonui; Douglas, A. C., Kaitaia; Davies, M. T., Okoroire; Hooton, W., Albany; Keen, James, Bay of Plenty; Thomas, F., Auckland; Watson, W. A., Parua Bay; Wells Bros., Whitianga; Bell, H., Kawhia; Bolton, W., Opotiki; McGill, P. R., Rewati; Gardiner, S., Kiokio; Chapman, R. H., Thames; Faithful, A., Te Ahuahu; Manuel, W., Waimate North; Holneck, E., Ruatangata; Lewis, E., Utakuri; McKay, A. J., Kamo; Marr, J. R., Waimate North; Nixon, H. J., Okaihau; Pfister, M., Bay of Islands; Paine, F., Roto-orangi; Westbury, A. P., Huntly West; Warner, A., Waikato; Webster, J. R., Rototuna; Wintour, S., Te Rapa; Webb, C., Pukeatua; Williamson, J., Cambridge; Whittle, James, Te Awamutu; Dimond Bros., Waitomo; Kerr, R. D., Whitford; Karl, C., Rotorua; Buckthought, S. W., Gisborne; Redfern, A., Kihikihi; Schnackberg, E. H., Kawhia; Seccombe, T., Te Teko; Sefton, E., Huntly West; Schepens, E., Waimatenui; Schlaepfer, J., Pukekohe; Smith, G., Manurewa; Stokes, G. F., Papakura; Smedley, F., Hobsonville; Sheard, W., Newstead; Thomson, T. K., Pongakawa; McCullock, N., Thames; McKay, R. R., Waipu; Neal, C. C., Okauia; O'Connor, D., Te Kowhai; Oates, W., Waikato; Pearson, W., Waikato; Proudlock, A., Raglan; Porter, F., Otorohanga; Phillips, John, Bay of Plenty; Roe, A. W., Tirau; Ross and Redshaw, Paengaroa; Dawson, J., Matamata; Fraser, F. F., Makauiti; Ferguson, A., Kikikihi; Grace, T. C., Pirongia; Grant, A. McG., Te Whaiti; Gower, A., Cambridge; Given, R., Walton; Goudie, —, Whakarewarewa; James, E., Ngaruawahia; Keegan, P., Whakatane; McKay, G., North Wairoa; Bluett, C. A., Matumaoho; Bellingham, G., Tuakau; Barter, N., Hunua; Bentley, E. S., Whakatane; Bloomfield, F., Waiharara; Clemow, S., Oneroa; Carless, T., Ngaruawahia; Clark, J. W., Morrinsville; Carruth, R., Okoroire; Duffus, W., Waikato; Davey, S. H., Te Aroha; Taylor, R., Te Araroa; Knight, S., Ongarue; Knight, J., Albany; Lawson, J., Otorohanga; Tokonui Mental Hospital, Te Awamutu; Lightbody, R. E., East Taupo; Lindsay, W. W., Otorohanga; Armstrong, F.,

Opotiki; Burgess, H. E., Gisborne; Budden, B. H., Te Awamutu; Crawford, A., Kamo; Hicks, T. A., Cambridge; Harsant, E. M., Raglan; Humphries and Scanlon, Matakana; Hansen, F. C., Waitoa; Mayall, H., Waikato; McAdam, W. B., Kawa; McRae, D. F., Wellsford; Morice, W., Opotiki; Mohring, F. H., Te Aroha; Toiao, W. R., Ngaruawahia. *Season 1913–14.*—Hallen, A. H., Clevedon; Davies, W. T., Taupiri; Heather, W., Whangarei; Cameron, James, Walton; Chalmers, J. S., Pirongia; Given, R., Aotea; McKenzie, A., Kerrydale, Waihou; Carlton, J., jun., Carlton, Whangarei; Allen, J. C., Piako; Knight, S., Ongarue; Arundell, W., Patea; Browne, S. A., Clevedon; Morice, W., Opotiki; Sircombe, R. S., Otorohanga; Haines, A. G., Tahiki; Pye, W. J., Redvale, Auckland; Wheeler, W. C., Clevedon; Brown, P., Brown's Bay Takapun; Bodmin, E., Morrinsville; Salmon, J. C., Taupiri; Shaw, John, Clevedon; Dunn, A. R., Alfriston; Fell, A. G., Oponini; Dale, S. H., Hobsonville; Bell, W. C., Tauranga; Spence, M., Tauranga; Bennett, H. D., Taihape; Ramsay, W. B., Bombay; Chrispe, H. M., Pukekohe; McNaughton, A. S., Papakura; Schlaepfer, —, Pukekohe; Gratten, F. C., Bombay; Gosnell, J., Tolaga Bay; Kavanagh, F., Patumahoe; Scown, F. S., Otahuhu; Gothorp, B., Alfriston; Gordon-Jones, W. G., Taheki, Hokianga; Hamilton, A., Rotorua; Mannion, J. D., Epsom; Jones, H. L., Te Aroha; Fraser, F., Titoki; Radcliffe, H., Matata; Rodgers, W., Putaruru; Minchin, G. H., Whangarei; Hutchins, W. A., Ruatangata; Mills, W. J., Te Awamutu; Ross, D. A., Pipiroa, Thames; Parkinson, T., Matata; Cuff, E. C., Patumahoe; Parker, J., Tamaki West; James, Thomas, Te Kuiti; Clayton, F. D., Manurewa; Tremaine, H. S., Ruatangata; Sydenham, W., Opotiki; Dalton, John, Taumarunui; Cuff, H., Matata; McCaw, J. W., Matamata; Wilson, W. S., Taihoa, Matamata; O'Donoghue, M., Waihou, Piako; Vince, George, Ramarama; Hope, F., Titirangi; McConnell Bros., Hunua; Scott, J. W., Kaukapakapa; Mannion, J. D., Auckland; Wood, C., Tauranga; Cole, G. C., Gisborne; Atkinson, T. R., Silverdale; Clements, W. J., Paengaroa; Geck, F., Waikino; Wright, Mrs. E. P., Raupo; Osmond, C. C., Helensville; Mundt, W. F., Paengaroa; Milicich, J., Silverdale; Phair, S., Ohinewai; Maria, J. Albert, Mangonui; McGowan, A., Oneroa.

Hawke's Bay, Season 1909–10.—Hutchinson, F., Rissington; Wellwood, A., Riverlea. *Season 1911–12.*—Pilcher, W. E., Raumati; Johnstone, D., Dannevirke; Bryant, W., Woodville; Badland, B., Hastings; Hall, G. B., Takapau; Rich, John, Havelock; Wilson, R., Hastings; Walker, S., Raumati. *Season 1912–13.*—White, E., Waipukurau; Young, J., Hastings; Riddell, J. A., Dannevirke; Hart, James, Raumati; Bergersen, A., Takapau; Littlejohn, J., Ongaonga; Butt, A. W., Clive; Cordell, A. E., Umutaoroa; Clark, D. G., Dannevirke; Nikolaison, M. A., Ormondville; Roulston, J., Umutaoroa; Veale, J. B., Woodville; Walsh, M., Umutaoroa. *Season 1913–14.*—Powdrell, J., Turiroa, Wairoa; Marshall, H., Nuhaka; Tod, G. T., Corozo; Byrne, T. F., Frasertown; Dickie, S., Marumaru; Mackay, W., Kiwi Station, Wairoa; Gauster, R. F., Springfield, Mohaka; Nutt, T. A. W., Wanstead; Edwards, A. F., Woodville; McFarlane, G. D., Woodville; Ebbett, J. H., Woodville. *Season 1914–15.*—Nutt, T. A. W., Wanstead; Escreet, F., Norsewood; Smith, P., Norsewood; Hobson, T., Takapau; Oldershaw, R. B., Norsewood; Baumgart, A., Norsewood.

Taranaki, Season 1911–12.—Schultz, H., Ball Road; Freeth, N. J., Urenui; Tarrant, L. K., Ngaere; Vaullairs, H., Riverlea; Clarke, C., Riverlea; Valentine, H. J., Eltham; Were, J., Normanby; Willis, D. J., Inaha; Amos, C., Ball Road; Buxton, H., Hawera; Blackbourne Bros., Inglewood; Barleyman, J. H., Waitara; Dunlop, F., Hawera; Parsons, N. J., Pukearuhe. *Season 1912–13.*—Gatenby, R. H., Toko; Jones, J. O., Bell Block; Winks, T. A., Hawera; Young, O. M., Otakeho; Hamilton, F., Stratford; Parfitt, G. W., Hawera; Todd, D., Inglewood; Wells, W. T. P., Manaia; Vivian, L., Midhirst; Tarrant, L. K., Ngaere; Johnson, H. E., Hawera; Brooking, W., Stratford; Rutledge, W. H., Stratford; Ecclesfield, T., Hawera; Taylor, G., Hawera; Hunger, A., Eltham; Herbert, G. H., Taranaki; Hosking, W. V., Midhirst; Morris, R., Opunake; May, J., Eltham; Thurston, W. G., Strathmore; Harrison, C. H., Ngaere; Blackhall, T. N., Lepperton; Saxton, S. W., New Plymouth; Harkness, B., Stratford; Batten, J. W., Inaha; Weston, T. A., Inglewood; McCaul, W., jun., Sentry Hill; Arundell, W., Patea; Budge, C. A., Hawera; Hobbs, T. C., Hawera; Law, Joseph, Stratford. *Season 1913–14.*—Paterson, R., jun., Taramakau; Connett, J., Bell Block; Ecclesfield, T., Hawera; Mounsey, R., Stratford; Hannah, W., Stratford; Chainey, A. J., Toko; Robertson, A. McG., Hawera; O'Donnell, A. and J., Inaha; Butler, E. J., Ununui; Betts, H., Okaiawa; Edwards, W., Oeo; Sage, R. S., Hawera; Ryder, A. R., New Plymouth; Savage, R., Midhirst; Walsh, J. T., Stratford;

Johns, R., Okaiawa; Skelton, R., Fitzroy; Barnett, A. H., Purangi, Clifton; Gaustad, G. A., Urenui; McCaul, W., jun., Sentry Hill; Badcock Bros., Whakamara; Weston, T. A., Inglewood; Lever, E. T., Inglewood. *Season 1914–15.*—Silk, H. N., Stratford; Fitzgerald, J., Hawera; Penny, J., Mangatoki; Marshall, W., Inglewood; Blackhall, T. N., Lepperton; Surman, W., Lepperton; Were, W. H., Toko; Mounsey, R., Stratford; Arundell, W., Patea; Groshinski, B. J., Te Wera.

Wellington, Season 1909–10.—Balsillie, J., Kairanga; Brechin, J. G., Pahiatua; Chambers, B., Rukumoana; Dalrymple, R. K., Bull's; Ellis Bros., Bull's; Houghton, C. J., Marton; Marshall, G. L., Bull's; Morris, B., Eketahuna; Short, E., Waituna West. *Season 1910–11.*—Anderson, P., Rongotea; Booth, H., Feilding; Fraser, A., Bull's; McKillop, J. E., Masterton; Palmes, E., Levin. *Season 1911–12.*—Hunt, H. H., Rongotea; McLeavey, J. A., Palmerston North; O'Neale, A. E., Featherston; Stretton, W., Feilding; Taylor, W. J., Wellington; Thorne, A., Levin; Booth, H., Feilding; Balsillie, J., Kairanga; Morris, B., Eketahuna; Harrison, T., Ashhurst; Marshall, G. L., Marton; Hunter, J., Masterton; Cameron, W., Masterton; Stephens, B., Ashhurst; Knight, J., Feilding; McKenzie, W., Palmerston North; Wilson Bros., Oroua; Moar, S., Pohangina; Ellis, W. A., Marton. *Season 1912–13.*—Doolan, M., Silverstream; Barnett, Dr., Taihape; Bygum, H. A., Masterton; Beale, K., Rangiotu; Hall, H., Kimbolton; Frost Bros., Moumahaki; McKenzie, W., Palmerston North; Wood, A. B., Masterton; Meek, W. L., Raetihi; Morris, B., Rongokokako; Raynell, W. R., Horopito; Field, W. H., Waikanae; Jordan, T., Halcombe; Jamieson, P., Matarawa; Officer, W. A., Mangaweka; Phillips, L. J., Kaitoke; Pedley, C. E., Rongotea; Prosser, J. H., Porirua; Russell, A. J., Halcombe; Ward, T. S., Raetihi; Waldin, W. R., Eketahuna; Weekes, O., Tiriraukawa; Maunsell, V. E., Carterton; Tolhurst, G., Otaki; Airey, L., Taikorea; Annaud, J., Mangamaire; Burling, G. A., Oroua Downs; Bates, Rev. D. C., Silverstream; Chesham, J. A., Martinborough; Crowe, A., Weraroa; Ellis, W. C., Carterton; Ferguson, J. M., Upper Hutt; Frost, G. A., Fitzherbert; Mowbray, W., Opaki; McKay, W., Apiti; Moyes, W. H., Palmerston North; Curno, Mrs., Manakau; Fitton, J., Paraparaumu; Shute, W. H., Masterton; Hall, W. A., Pahiatua; Hill, W., Silverstream; Higgin, D., Feilding; Herrick, E. M., Weraroa; Morrison, H. S., Pahiatua; Eagle, E., jun., Belvedere; Taylforth, J., Masterton; Tanner, R., Ballance; McArthur, T., Raetihi; Goringe, H., Masterton; Harvey, J., Kaiparora; McFarland, J., Aorangi; McMurtrie, A., Apiti; Shaw, S. B., Masterton; Wrigley, T. A., Kopuaranga; Kennedy, J., Karioi; Burrow, J., Wainuiomata. *Season 1913–14.*—Bower, D., Morrison's Bush; Linklater, J., Palmerston North; Renton, W., Himitangi; Pritchard, T., Kaupokonui; Handley, G. H., Rapanui; Evans, F., Masterton; McMurtrie, A., Apiti; Walker, J., Karioi; Warren, H., Featherston; Moynihan, M., Shannon; Cooper, W. J., Rapanui; Hotter, J. G., Rapanui; Hall, H., Kimbolton; Sievers Bros., Clareville; McFarland, J., Aorangi; Ronberg, O. P., Palmerston North; Frost, M. C., Ashhurst; Boyd, W. R., Matahiwi, Masterton; Johnston, C. F., Foxton; McKay, W., Apiti; Ward, F. D. B., Te Matai; Ross, R., Awahuri; Prior, A. E., Halcombe; Bartholomew, —, Feilding; McKay, P., Apiti; Fisher, W., Carterton; Hooker, A. E., Carrington; Matheson, W. B., Rongomai; Woodley, C., Newbury Line, Palmerston; Jeffries, J., Bunnythorpe; Harcombe, W. H., Masterton; Yeates, A. W., Halcombe; Dermer, C. H., Cheltenham; McRae, F. S., Palmerston North; Maunsell, F. E., Carterton; McManaway, H., Marton; Bacon, T., Pahiatua; Ordish, J. A., Dalefield; Powell, John, Rewa; Sandford, H., Kaupokonui; Berry, H. J., Kaupokonui; Brazendale, F., Dalefield; Brosnahan, D., Konini; Young, J., College Street, Palmerston North; Wallis, W. A., Ngaturi. *Season 1914–15.*—Killeen, C., Manakau; Mason, T. A. W., Palmerston North; Kurth, J. A., Rapanui; Glenn, W. S., Makirikiri; Port, W., Ashhurst; Troup, G. A., Wellington; Read, F., Te Wharau; Moore, R. S., Awahuri; Corpe, J., Cunningham's; Bolton, G., Raetihi; Moynihan, M., Shannon; Carey, K. LeM., Atea; Morris, B., Rongokokako; Hintz, B., Westmere; Griffiths Bros., Otaki Railway; Brazendale, F., Dalefield; McPhee, H., Carterton; Beetham, B. W., Colyton; Forsberg, A., Mauriceville W.; Ross, R., Awahuri; Cooper, W. J., Rapanui.

A crop of 9 acres of tares at the Weraroa Experimental Farm, on which sheep were grazed during the winter months, and which was shut up for harvesting in the month of August, has given a return of 336 bushels, or just on 38 bushels to the acre.

GROW MORE WHEAT!

THE Board of Agriculture has issued the following statement in regard to wheat-production, in the hope that farmers will grow as much wheat as their mode of farming and their environment will allow: -

"The Board of Agriculture would like to remind the farmers of New Zealand of the great necessity, in the interests of the Empire, that the wheat areas should be largely augmented. To ensure our crop of wheat in the coming season being sufficient to feed the people of New Zealand, and leave enough for seed for the following season, at least 240,000 acres would require to be sown. The area in wheat during the present season has been 189,000 acres, so that 50,000 acres, or about 27 per cent., more would require to be sown in the coming season than the present one to ensure that there is sufficient for the Dominion's use. Less would probably mean we should have to buy outside and from other countries probably less favoured than ourselves.

"As the restriction as to price has been taken off by the Government, there is every reason to think that the price will be a remunerative one. The Board would also like to suggest that those who intend to sow wheat in the coming season should procure seed grown in the Dominion, as imported wheat requires a considerable time to acclimatize, and generally gives unsatisfactory yields the first season.

"The Board would caution farmers, however, that the above area should not be deducted from the area usually devoted to oats, for if this were done the oats and chaff grown would not be sufficient for our wants."

DEAR RAPE-SEED.

ONE of the most serious features of the farm-seed position is the great shortage of rape-seed that will be experienced this year. As a general rule the low countries of Europe are our main source of supply, but at the present time rape-seed is more valuable for war purposes than for exportation. It is doubtful, therefore, if a single ounce of European rape-seed will be available. The present wholesale price of rape-seed—roughly, £80 a ton—a price higher than has yet been experienced, is likely to advance steadily. Farmers are, therefore, urged to procure, if possible, immediately their supplies for 1915. This shortage in rape-seed is quite the most serious happening in the farm-seed trade.—*A. H. Cockayne.*

CATECHISM OF PRACTICAL AGRICULTURE.

CONTINUED.

PRIMROSE McCONNELL.

CULTIVATION.

51. *How would you define the word "cultivation"?*

Cultivation consists of certain operations carried out on or in the soil, with the object of creating an ideal environment for domesticated animal and vegetable life.

52. *What is the first essential in thorough cultivation?*

The first essential is good drainage, which may be natural or artificial.

53. *How does badly drained soil affect plant-life?*

It affects plant-life deleteriously, principally by hindering the free admission of air, and under such conditions plants do not thrive.

54. *How does badly drained soil affect farm live-stock?*

It affects farm live-stock detrimentally, for the reason that it produces food of an inferior nature, and is also a breeding-ground for many of the internal parasites which cause enormous loss of horses, cattle, and sheep.

55. *Name some other essentials in thorough cultivation.*

The thorough stirring of the soil by various farm implements; the application of plant-food (in which the soil may be deficient) in the form of chemical manures, farmyard manure, or green crops ploughed under.

56. *How is the thorough stirring of the soil beneficial?*

When a soil is well stirred and brought to a fine tilth much dormant plant-food is made available; seeds germinate better; the plant-roots penetrate in all directions more freely, giving them greater range for collecting plant-food; the soil is aerated, which, as far as we know, is necessary for the beneficial action of the soil-organisms; and many weeds are destroyed which would hinder the growth of the cultivated crops.

57. *How does the presence of weeds hinder the successful growth of farm crops?*

(*a.*) They assimilate much of the plant-food that should go to the cultivated plant.

(*b.*) They are the hosts in certain stages in the life-history of many of the diseases that attack farm crops.

(*c.*) They are in some instances poisonous to farm stock, and in others give a bad flavour to dairy-produce.

(*d.*) In every instance weeds add to the cost of cultivation, and decrease the yield and quality of farm crops.

58. *What is the main cause of the spread of weeds?*

The increase of weeds is mainly caused by allowing their seeds to ripen before attempting to destroy the plants, also by the use of foul seeds.

59. *In cultivation work, how may much labour be saved in destroying weeds?*

By eradicating them as far as possible as soon as they appear.

60. *How may this be done without injury to the cultivated plants?*

By sowing the crops (cereals excepted) in rows sufficiently far apart to admit of horse-hoeing or intercultivation.

61. *Will intercultivation add much to the actual cost of producing the crop?*

No. A boy with a one-row horse-hoe will go over 3½ acres per day, and with a two-row single horse-hoe he will do at least 6 acres.

62. *Will the comparatively small cost of the additional cultivation be recovered by an increase of crop?*

Yes. The increase of crop will yield a handsome return for the outlay of the extra cultivation.

63. *In the cereal crops is intercultivation possible?*

Yes. Many of the weeds may be destroyed by tine-harrowing when the cereal plants are about 6 in. in height.

64. *Will the harrowing have a beneficial effect other than the eradication of weeds?*

Yes; the harrowing, by breaking the surface-soil and admitting the air, will have a stimulating effect on the growth of the cereal plants. The loosened soil will also form a light mulch, which to some extent minimizes the effects of drought.

65. *Is it possible to smother weeds by any system of ploughing?*

Yes; a considerable percentage of weeds may be completely smothered by the use of a digging-plough with skimmer attachment.

66. *Describe the action of this plough.*

The skimmer attachment on the beam of the plough turns a light top sod into the bottom of the furrow, and the share and mouldboard behind turn several inches on top of the first light furrow. A wing attachment on the mouldboard breaks up the furrow, spreads the soil evenly, and fills up the spaces.

67. *Is it beneficial to plough all land to a considerable depth? State the reason.*

No: in the case of land with a shallow surface-soil and sour, bad subsoil it is not good policy to plough too deeply, as such a subsoil contains many toxins or plant-poisons. They should only be turned up a little at a time, and the depth of the ploughing very gradually increased.

68. *In such cases, how may the subsoil be stirred to a good depth and yet not brought to the surface?*

By the use of a strong tined cultivator or a subsoil plough, which turns over a furrow at a depth proportionate to the nature of the soil, and at the same time, by means of a separate attachment, penetrates and stirs the subsoil to a considerable depth without bringing it to the surface.

69. *Is there any kind of soil which does not require deep stirring?*

Yes; a loose sandy soil should be ploughed to a fair depth, but it is not necessary to stir the subsoil.

70. *What class of soil responds best to deep ploughing?*

A good deep loam.

71. *Is it necessary to plough a virgin loam deeply?*

No; but the depth should be gradually increased for successive crops until it reaches a maximum of 10 in. or 12 in.

72. *In a cropping rotation, is it necessary to plough deeply for each crop?*

No.

73. *For which crops would you plough deepest?*

For a summer fallow crop, such as turnips, mangels, potatoes, &c.

74. *For which crops would you plough comparatively shallow?*

For the cereal crops, with the exception of wheat, which will respond to deep ploughing.

75. *In cultivation work, what is the greatest advantage of a comparatively light soil?*

A light soil may be cultivated when in a moist condition without injury to its texture, whereas a clay soil is greatly injured when cultivated in a wet state.

76. *If the latter is ploughed in a wet condition, what happens?*

It becomes hard and brick-like, and it is almost impossible to force a good tilth.

77. *In such cases, what is the best procedure?*

Allow the soil to dry thoroughly in the furrow, then immediately after the first good rain it will fall almost like slaked lime-shell, and no time should be lost in setting the harrows, &c., to work.

78. *On the other hand, what is the advantage of a comparatively heavy soil under good cultivation?*

A heavy soil, if well drained and cultivated, grows crops in every way superior to those grown on light soils.

Some people seem to think that the land campaign, which was gathering strength on the outbreak of the war, has been done for by Armageddon. I do not think so for a moment. The case for creating a better, brighter, and lovelier countryside is stronger than ever. We see that, in a time of emergency, the strong back and clear eye of the countryman are the very reservoir of national strength. We realize as we never did before how much it concerns the welfare of the United Kingdom to make rural life a finer thing than it has been.—"*Home Counties*" in the *World's Work.*

The poorest portion of the nursery of the Ruakura Farm of Instruction, where it was always difficult to control couch, was sown thickly last autumn with barley and horse-beans. This was dug in during the early spring. At the present time it is growing crops of beans and peas which are exhibiting a richer-coloured foliage and finer development than crops growing in other sections of the nursery. Obviously this is principally due to the moist condition of the soil brought about by the heavy green-manuring, which effectively prevented the soil being dried up by the prolonged period of dry weather.

WORK FOR THE COMING MONTH.

NEW ZEALAND is a country of wide variation in climatic and soil conditions. In applying suggested procedure it is, therefore, necessary for the farmer to amend it to suit local weather-conditions and the requirements of his soil—information which can best be ascertained by a study of these problems on the part of the farmer himself. Nothing can take the place of local knowledge. Little advice on an agricultural subject is capable of general application in its entirety.

THE FARM.

PRIMROSE McCONNELL.

With the exception of a good rain which fell on the 29th January, drought conditions still hold at the date of writing (end of February). Sufficient rain fell on the above date to set turnip and other root crops going, but not sufficient for the pastures.

The abnormal drought has more than ever emphasized the incalculable value of lucerne. Now is the time to commence preparing for next spring sowing. For those who have tested this king of all fodder plants it is extremely difficult to understand the hesitancy of many farmers in setting about its cultivation. As daily inquiries come to hand *re* the cultivation of this crop, a few hints through the medium of these notes may not be considered out of place, even although similar advice has been given by the writer on many occasions.

An attempt should be made to grow lucerne on any soil that is not waterlogged or has not an underlying stratum of rock which comes comparatively close to the surface. Where hard beds of iron pan come close to the surface success will be doubtful, and a similar remark applies to pure peat soils. It is also much better to sow lucerne on land that has been previously cropped than on land that is absolutely raw or newly ploughed old pasture. Best results are had from soil which has grown a fallow or cleaning crop, such as potatoes, turnips, mangels, &c. The land should be ploughed as soon as possible, and to as great a depth as the subsoil will permit. After ploughing, apply carbonate of lime at the rate of 1 ton per acre; work the land to a fine tilth, and sow a catch-crop for ploughing under as green manure. Tares are good for this purpose, but the present price is almost prohibitive. White

mustard will serve the purpose excellently. It should be sown at the rate of 10 lb. per acre, and a little phosphates be applied to ensure a large bulk of stuff for ploughing under, which operation should be carried out when the plants are coming into flower. At this stage do not plough too deeply, so that it will be possible to go deeper next ploughing and bring the lime near to the surface again. Lime, more than any other manure, has a tendency to go downwards. Allow the ploughed-under crop to remain undisturbed for some weeks, in the meantime giving the surface an occasional harrow to destroy weeds as they germinate. Plough deeply again about the beginning of October, roll, and work the soil to a fine tilth. If the land is foul with weeds, the lucerne-sowing should be delayed until the weeds are eradicated as far as possible by repeated surface cultivation. Sow basic superphosphate at the rate of 5 cwt. per acre about a fortnight before sowing the seed, and the inoculating-soil at the rate of not less than 2 cwt. per acre just previous to sowing the seed, care being taken that it is immediately harrowed in. The Cambridge roller should immediately precede the sowing of the seed,* which should be broadcasted, and covered in with a light tine, chain, or brush harrow. If of a light nature, the land may be rolled again, which completes the operation. The manure advised above may be changed to 4 cwt. basic super. plus 1 cwt. sulphate of potash if the soil is of a sandy, light nature, but this manure should not be mixed with the seed. When the plants are about 3 in. in height a light tine-harrowing may be given, which will stimulate the growth of the lucerne and destroy many weeds. The writer recognizes that inoculation is not necessary on all soils, but the difficulty is that we have no means of determining beforehand whether it is safe to omit this operation, and the cost is so small that it is wise not to run any risk of failure by the omission. On rich soils a lighter dressing of manure will suffice. Probably the best time for sowing is the beginning of November, provided the land is clean and thoroughly prepared as advised above. At Ruakura 16 acres were sown on the 8th February, and the stand at present promises to be excellent. In localities where the heavy freight charges are a serious consideration the ground burnt lime, at the rate of 10 cwt. per acre, may be used in place of the carbonate.

In some localities of the North Island oat-sowing is done in April, but as a rule May is early enough. The seed should be the best procurable, and should be free from weed-seeds. It should also receive a dressing of formalin as a smut-preventive. The solution

* 15 lb. per acre.

should be at the rate of 1 lb. of formalin to 40 gallons of water, or 1 in 400. The seed should be spread on a clean floor and thoroughly sprinkled with the solution (a knapsack spray-pump is excellent for the purpose), and repeatedly turned over until every grain is wet. It may then be heaped up and covered with clean sacks until the following morning, when it will be in condition for sowing. The germination is slightly injured if the sowing is delayed for some days after the solution is applied. The seed-bed for oats and all other cereals should be deep and fine, but to prevent the seed from being covered too deeply it is well to roll in front of the drill, because it has been abundantly proved that too deep drilling results in a comparatively inferior crop. Except on rich soils it is good policy to apply about 1 cwt. basic superphosphate per acre, and on light soils add 10 lb. sulphate of potash. This inexpensive dressing will improve the quality of the grain and ensure an earlier harvest.

The ploughing of land for coming fallow crops should be proceeded with. It should be deep and thorough, the depth of the furrow being determined by the nature of the subsoil.

Grass- and clover-seed sowing may still be carried out, weather permitting. In a previous article it was stated that no drill on the market would effectively sow Western Wolths seed, but the writer has since discovered that a certain make of broadcast manure-drill will sow it to perfection, or, in fact, any grass-and-clover prescription; but the manures should not be mixed with the seeds. When the broadcast drill is used for sowing Western Wolths it should be followed by a light disk, then tine-harrow and roll, or, if the land has been well ploughed, the seed may be sown on the furrow, then well tine-harrowed and rolled.

Potato-digging should be completed, the land well cultivated, and all reject potatoes gathered off.

Forage crops, such as Western Wolths, crimson clover, tares, peas, mustard, barley, &c., may be sown in April.

Respecting the pig herd, it is good policy to mate as many sows as possible in April, because they will farrow just when milk is most plentiful. On a dairy farm pig-breeding is a most profitable side-line, but only the best class should be kept. At Ruakura the foundation of a Berkshire herd was laid less than three years ago by the purchase of six sows and a boar. During the past year the sum of £400 has been realized by the sale of pigs, all of which were bred on the farm, and the present herd numbers eighty. The accommodation is exceedingly primitive, but the writer does not consider that elaborate piggeries are a necessity. A few commodious well-ventilated huts on runners is all that is required—one to each

small paddock of about half an acre in extent. The advantage of such huts is that they are easily moved to clean ground. Low shelters with open sides should also be erected as a protection from the sun. The material for each consists of four posts, and a few strong rails to support the covering, which may be of manuka or pine branches, or anything of a similar nature. All reject potatoes should be reserved for pig-feed, but they should be boiled. It is about the only pig-food that is improved by cooking. Raw potatoes, if used in quantity, are injurious. A small area of lucerne will supply excellent green feed during summer, and mangels are excellent for winter. Young pigs should always have sufficient nourishing food to keep them in good thriving condition, because, as is the case with other young farm stock, a check when young is very detrimental.

Foals should now be weaned, but it is the height of folly to turn them out to scratch for their living on a bare pasture without the aid of a little sweet chaff or even hay.

THE ORCHARD.

J. A. CAMPBELL.

THE principal work in the orchard for the month will be in harvesting and storing late varieties of pears and apples, and in packing and shipping those required for export. In this respect growers in those districts enjoying the advantages of central packing and cool-storage facilities will find their work considerably lightened as compared with the old days, when all their fruit had to be packed in the orchard and stored in pits, &c. These modern means of dealing with the fruit crop have been many times advocated in this *Journal* and approved by practically every fruitgrowers' association in New Zealand. At the present time a few districts only have these advantages, but no doubt in the near future the opportunities offered under the new Fruit-preserving Industries Act will be availed of and other stores erected. Central packing not only relieves the orchardist of a considerable amount of work, leaving him free to attend to other necessary matters in connection with his orchard, but it also means that the work, being done by a staff of experts, must naturally result in a more uniform grade and pack than when done by growers themselves, many of whom have not the necessary facilities or a knowledge of up-to-date methods of packing. At the

same time, orchard packing has one advantage over central packing as at present carried out. I mention this in order that this one disadvantage may be overcome as much as possible. It is generally understood, although not always practised, that fruit should be handled as carefully as possible, especially if required for storing or for shipping long distances. In this respect, other things being equal, fruit packed in the orchard requires less handling, and is consequently less liable to bruising than when carted as at present, loosely packed in open cases, more or less long distances, to the packing-house. Bruised fruit will naturally decay more quickly than sound fruit, but even this class will keep longer than fruit having a freshly broken or punctured skin, especially if the latter is immediately wrapped in paper and packed in wood-wool, the conditions of the packed case preventing the wound from drying, with the result that a mouldy rot will set in almost at once. Carting loose fruit in the above manner over rough roads not only results in bruising but also in the stem of one apple puncturing another. This stem-puncturing is often very slight, only just breaking the skin, and leaving little to indicate the injury, with the result that many are packed which, particularly with some varieties, very soon decay in the case. To avoid this damage as much as possible, well-made shallow cases should be used in preference to deep ones, in order to lessen the weight of fruit and the damage otherwise likely to occur to the lower tiers in the case. A pad of wood-wool or plaited straw made to fit the case should be placed on top of the fruit and held in place by the next tier of cases. Otherwise, place a pad of wood-wool on top of the fruit sufficient to prevent the contents from moving, and nail the lids on. In this way fruit can be carried to the store with little or no damage.

SPRAYING.

Although there are instances where growers have considered certain spraying advisable during the early part of this month, this, if at all, is seldom necessary, so it can now be fairly safely concluded that all spraying operations are finished for the season.

The plant may now be put by for a short time, but before doing so all defects, whilst fresh in mind, should be remedied; hoses and nozzles renovated or renewed, valves attended to, &c. In fact, a thorough overhauling should be given to the plant whether it be a hand or power machine, so that it will be in thorough working-order when required for the commencement of next season's work.

Now also is the time for a final consultation and study of the "Orchard Diary"—a record which every orchardist should keep,

covering the whole working of the orchard for the year, particularly in reference to time and conditions under which the various sprays have been applied and the results attained. It is only by taking advantage of his own experiences or of those of others that progress in this direction can be made; besides, every orchardist should be prepared to contribute as far as possible to the general advancement in the control of orchard diseases. This can only be done by working intelligently, which certainly includes the taking of careful records.

Having carefully studied the results of last season's work, and having formulated a plan of campaign for the coming one, the necessary ingredients can with safety and advantage be ordered as early as possible.

CASE TIMBER.

Contracts for the supply of case timber for the 1915–16 season will soon be coming up for discussion and settlement by various associations and individual growers. In this connection consideration should be given to what is generally known as the "new standard case." The many advantages of this case over the one previously in common use have several times been mentioned in this *Journal* and conceded by fruitgrowers throughout the Dominion. The case was also adopted by the New Zealand Fruitgrowers' Federation, and it will no doubt be used largely in the export of apples this season. All those interested in the fruit business should endeavour to hasten its general adoption by ordering where possible timber cut in suitable sizes for its construction. The new case has the following advantages: (1) It holds an imperial bushel of apples; (2) it opens up well, showing the fruit to the best advantage; (3) it is more adaptable for packing into; (4) for carriage by sea it reduces waste space to a minimum, as it is possible to stow twenty-five cases to the ton by measurement, against twenty-three of the case now in use. Following are the measurements: Heads, 10 in. by 11¼ in. by ¾ in.; sides, two pieces each 5 in. by 21¼ in. by $\frac{5}{16}$ in.; bottom, two pieces each 5½ in. by 21¼ in. by $\frac{5}{16}$ in.; top, one piece 11 in. by 21¼ in. by $\frac{5}{16}$ in., or two pieces 5½ in. by 21¼ in. by $\frac{5}{16}$ in.

ORCHARD EXTENSION.

As I intend dealing more fully with this subject in the next issue I shall confine my remarks to the selection of trees for planting, with a reminder to intending planters regarding shortage of supplies, particularly in the popular varieties of apples and pears suitable for planting, which occurred in many districts last season, considerable disappointment being caused through the inability of nurserymen to execute orders late in the season. In several instances, on account of having had their land prepared, growers

resorted to what I consider the unwise procedure of planting trees in the dormant bud and stock trees for the purpose of working over in the spring. In cases of this kind it would have been better to have utilized the land in some other way, planting out with fresh young trees the following year. The season is lost just the same by planting this class of tree. Besides, the cost of grafting has to be borne by the owner, who also has to bear the brunt of all failures and of damage to buds and grafts, which under ordinary circumstances comes within the province of the nurseryman. Of course, ordering at this stage does not allow of any increase in this season's stock, but it does provide for the making of other arrangements in cases where orders cannot be booked locally. In respect to ordering trees, the most satisfactory way both to nurserymen and growers is to order a season in advance. By doing this not only are supplies assured, but directions can be given to the nurseryman in reference to the manner in which the trees are to be grown. There are two distinct types of trees raised by most nurserymen. These are known as the "whip" and the "headed tree" respectively. Opinions differ very much in regard to the relative values of these trees for planting. The headed tree is raised as the result of nipping off the head of the young tree in the growing season when it has reached a height of about 18 in., the check causing the upper buds on the part remaining to break into growth, resulting in the formation of the head. A certain percentage of trees so treated form up well, but the majority, owing to the crowded state of the nursery rows and other causes, do not. These are sure to cause considerable perplexity to the pruner of moderate experience at the time of planting, and probably for several seasons later. The "whip" is the result of the bud being allowed to grow throughout the season without interference. If allowed to select my own trees I should always plant the headed type; otherwise I should order the raising of "whips."

THE POULTRY-YARD.

F. C. BROWN.

CULLING.

THERE is no more important subject to the poultrymen of this country at the present time than that of culling unprofitable stock. With the present high cost of production it is only the very best type of laying-bird that will show a profit, and every

inferior, and even medium, bird retained in the flock reduces the profit of the money-earning stock. Already the culling of flocks has been very severe, and further culling will in some cases take place from month to month. Culling, even under normal conditions, is imperative to the best results, and is usually not as drastic as it should be; now, however, it is being forced upon poultrymen. Indeed, in many cases the culling is at the present time more severe than it should be. The worst feature of this important work is that few men have that cultured eye for the laying-type, and capable of making due allowance for condition of the bird at the particular time, which is necessary to enable culling to be really effective; yet it is quite possible for those who have some enthusiasm for the business to educate themselves as to the class of bird which should make a profitable layer, having due regard to the maintenance of the necessary breed-characters. In order to assist readers to become proficient in the culling process the chief points to be considered are enumerated.

In the first case, points indicative of constitution must have prime importance attached to them. In too many instances indications of constitution are taken to be signs of nothing but laying-power, such as a bold, bright eye, legs set well apart, short shank, flat bone, and a bold, active carriage. These are points which the breeder of any class of stock looks to as indicative of constitutional vigour. Another constitutional point in fowls is tight feathering, which may be likened to a good healthy coat in other animals. Of course, the good constitution must be combined with indications of laying-power, principally contained in the conformation of the body combined with texture of the skin in the abdominal region. Any bird, such, for instance, as a game or a bantam, may have all the points enumerated for constitution, but the veriest amateur would condemn them on their appearance as laying-stock. Combined with the desired constitutional points and features suggestive of laying-power there must be due consideration given to breed-characteristics. Many utility-poultry keepers contend that egg-yielding power must be the first consideration, and that a few black feathers in a white bird, or feathering on the leg, or a red lobe where it should be a white one, or a wrong colour of eye, or a squirrel or wry tail have nothing to do with egg-production, and should not be considered in selecting a bird for a breeding-pen. The wise poultryman, however—he who has learnt in the school of long experience—knows better. He has found, probably to his serious loss, that in breeding from a heavy layer of a weak-breed type the breed-defect has been strengthened in the progeny, which have not only been disappointing as layers, but have proved absolute mongrels.

The reason was obvious. It is said that like begets like, but this is only where the parents are absolutely pure, and have no stain in their pedigrees. The appearance of bad breed-points is invariably an indication of reversion to an undesirable ancestor, probably a bird of another breed introduced at some time with the object of strengthening some particular character in the strain. Especially is it dangerous in these days to risk breeding from a bird weak in breed-points when it is remembered how strains, and even breeds, have been indiscriminately mixed by amateur breeders in their endeavour to find a short-cut to heavy egg-production. Their first crosses may have been quite phenomenal layers, but the subsequent generations distributed throughout the country have proved a source of vexation and loss to the unfortunate people into whose hands they fell. It would be interesting to have the correct history of many laying-strains of supposed purebred stock in this country. May poultry shows multiply and increase in importance, for these are practically the only means we have of maintaining in a state of purity the many beautiful breeds of poultry we have at our command. True, in the past an incorrect interpretation of the English standards led to judges favouring fancy abnormalities; but with a return, by means of properly conducted utility classes or a purebred-poultry show, to a correct reading of the standards it is to be hoped this regrettable tendency will be checked, and that the best stock at shows of the future will be birds in which beauty is happily combined, as it always should have been, with utility. The utility poultryman should meet the fancier more than half-way, then there might be some hope of ending in the near future the fiasco now common throughout the country of separate classes for fancy and utility stock. The poultry exhibit should be like the exhibit of all other agricultural stock in which the possession of breed-points is imperative, but must be accompanied by constitutional and utility characters. It will be a happy day for our industry when the fancy-poultry show passes out of existence to make way for exhibitions of purebred-poultry stock, when the fancier will have probably even better reward for his enthusiasm and energy than he has at the present time.

I have stressed the matter of breed-type in order to emphasize its importance in the perpetuation of developed characters. By all means aim at the high-type layer; but of what avail is it to secure an improved type in this connection if the desired development it possesses cannot be transmitted with any degree of certainty.

Having dealt with the fundamental importance of constitution in egg-producing stock and the value of purity of blood in order to ensure the perpetuation of improved laying-power, it is necessary to give as clear an idea as possible of the points indicative of egg-producing capacity. Summed up, the high-type layer should have a well-set-on head, a clean face free from wrinkles, a bold eye, and a medium-sized comb; be tightly feathered; have a fine texture of skin; have an oblong body on legs of medium thickness (the shank being short and the bone flat), set wide apart, well-developed crop, short and shallow keel, deep and full in abdomen (which should be soft to the touch), and wide across the saddle, a wedge-shaped appearance being thus presented from either the top or side viewpoints; and the bird should present an alert and vigorous appearance.

I would again repeat that all these signs, which must enter into the make-up of the best type of laying-bird, are not indicative of egg-producing capacity, for some are merely the signposts of constitutional vigour, without the possession of which the best-built layer ever hatched would be an unprofitable producer when the season's egg-yield is considered. A comparison with the dairy cow is instructive. It is not the animal that gives a great quantity of milk for a few months and then shuts up that is the profitable member of the herd, but the long-season milker that produces steadily from month to month and gives the highest yield in the year. We do not want so much a record number of eggs in one month as a record number in a year, and even in two years. The points which are solely indicative of egg-producing power are short and shallow keel, a broad saddle, legs wide apart (also an index of constitution): these providing for the deep and full abdomen, thereby enabling the necessary artificial development of the egg-cluster. The skin of the abdomen should be fine in texture, as should the skin throughout, as being indicative of a highly nervous temperament. The crop should be well developed. The keel should be short and shallow, in contradistinction to the table-bird, which requires a deep and long keel to carry that abundance of breast-meat which is so desirable in the table-bird. The short keel also implies greater room in the laying-bird's business end, while the broad saddle gives the necessary base for the roomy abdomen and the required space for the artificial egg-cluster. With proper development in this part of the bird's anatomy it is necessary that the legs must stand wide apart; the skin must be fine and soft to allow for the necessary expansion and contraction which take place in the laying and non-laying seasons. A well-developed crop is imperative, for it is obvious

that a heavy-laying bird must have the feeding and digestive power necessary to convert a large amount of food in the work of maintaining strong bodily vigour and manufacturing her great egg-supply. The special crop and abdominal development combine in giving the bird a relatively spare appearance on the breast, which must not be confused with a narrow chest and poor lung capacity. The heavy laying-bird must have a strong, active appearance, for its life is a busy one, manufacturing as it does for its size a more concentrated and valuable food commodity than any other domesticated animal.

For the benefit of the many readers who have expressed a desire to thoroughly study the desirable type of bird to retain in their flocks it may be well to quote the standard of the Department for the judging of utility stock, as by this means they will be able to gain the fullest benefit from an inspection of the utility classes at their local poultry shows. The standard as circulated by the New Zealand Utility Poultry Club is as follows:—

MODIFIED STANDARD FOR JUDGING UTILITY POULTRY.

Submitted by the Department of Agriculture, Industries, and Commerce, and after several conferences with the Government Poultry Instructor (Mr. F. Brown) the following standard has been approved by the N.Z.U.P.C.:—

	Scale of Points. Deduct up to
Eye—Large, prominent, and bright	8 points.
Face—Fine, clean, free from wrinkles and feathers	5 ,,
Comb—	
Single-comb breeds, thin; texture fine Rose-comb breeds; neatly set, texture fine	5 ,,
Neck—Rather long, thin at head	5 ,,
Legs and Shanks—Medium to short, with fine bone inclined to be flat	6 ,,
Keel—Short	5 ,,
Abdomen—Deep, broad, full, and soft; texture fine	10 ,,
Feather—Tight and dense, showing ample fluff	6 ,,
Colour—English Poultry Club's standard, including beak, eye, face, lobe, legs, and plumage	15 ,,
Carriage and Shape—Alert, body inclined oblong; full at crop, tapering from thighs to head, forming wedge-like appearance	15 ,,
Size—Medium, or 1 lb. less than English Poultry Club's standard weight clauses. In the case of Leghorns, pullets, 4½ lb.; hens, 5 lb.; cockerels, 5 lb.; cocks, 6 lb.	10 ,,
Condition	10 ,,
A perfect bird to count	100 points.

Defects—Same as English Poultry Club's standard. Faking, disqualification.

Since the above was issued I have suggested a few additions and amendments. These are: Comb, medium size, texture fine; legs and shanks, shanks short, legs set well back and wide apart; bone inclined flat and of medium thickness; keel, short and shallow; carriage and shape (or type), body inclined oblong, broad at saddle,

full at crop, slightly tapering from thighs to head, forming wedge-shape appearance from top or side viewpoint.

These points apply to all breeds of utility stock. For breed-points we have the English standards to guide us. If these be intelligently interpreted they are, with the modifications of the Department's utility standard, quite sufficient for our purpose. The sole object of the Department in agreeing to draw up an

The White Leghorn as drawn by Ludlow in Lewis Wright's work to typify the ideal to aim at under the English Poultry Club's standard.

A White Leghorn cockerel declared to be the best of its age in England last year by the leading fancy judges under the same English Poultry Club's standard.

The Ludlow White Leghorn.

The type the fancier has made it.

official standard was to furnish some guide whereby extreme fancy points could be cut, and the breeding thereby encouraged of birds which, while true to the type of their respective breeds, yet possess the necessary utility-characters — characters which were largely possessed by the original types of the breeds, as indicated by Ludlow's plates in Lewis Wright's great work, but which have been lost to a great extent by a wrongful interpretation of the standards by judges of fancy stock.

NATURAL TYPE, OR TABLE-BIRD.

SPECIAL EGG TYPE.

If imaginary lines be drawn through the carcase of the special table-bird, as in the case of the left-hand drawing, it will be found that the longest lines come through the breast, and the shortest from the saddle to the abdomen. On the other hand, if imaginary lines be drawn through the high-type layer, as in the diagram on the right, the longest lines will come from the saddle to the base of the abdomen, while the shortest lines will be found from the shoulder to the breast-bone. In the first case the conformation indicates table-quality; in the second case it indicates egg-producing power.

THINGS TO REMEMBER.

All surplus cockerels four and a half months old and over should now have been marketed.

The best layer will not be profitable if she has not the necessary material from which to produce her special egg-yield.

The inclusion of maize in the grain ration at the present time —when colder weather is being experienced—will have a beneficial effect. It will also be relished by the hens.

Desired laying-type and sound constitution are mostly found in the late moulters. These should be marked before moulting for next season's breeding-pens.

Although food is dear the good layer should return a profit over her keep. Yet the natural tendency of many good hens to lay eggs has been seriously checked at the present time by the want of sufficient food, or food of the right character.

EGG-PRODUCTION IN AMERICA.

WRITING of the proposed exportation of Californian eggs to New Zealand—the chief consignment, it was expected, was to be shipped in the early part of March—Mr. E. Clifton, New Zealand Trade Commissioner at San Francisco, says: "I do not for one moment believe that this can possibly go on as a reasonable commercial transaction. Poultry-farmers here are somewhat in the same position as those in New Zealand: the high price of poultry-feed has induced all of them to cull their flocks. This has resulted in the market being flooded with 'boiling-fowls.'"

CULLING.

THOSE desiring assistance in the work of culling their flocks may obtain the services of the Poultry Instructor, or one of his two assistants, on application to the Director of Live-stock and Meat Division of the Department. Application will be considered in the order of priority, and will be complied with as promptly as the performance of the main duties of these officers will permit.

THE APIARY.

F. A. JACOBSEN.

SAFE WINTERING.

AT all times of the season it is frequently necessary to unite one colony with another. Sometimes colonies become queenless when it is not practicable to give them another queen, and then the best course to pursue is to unite the queenless colony to one of normal strength. If colonies happen to be weak in the autumn it is advisable, even if they have a queen, to unite two or more of them to ensure safe wintering, always, of course, keeping the best queen.

Many things may occur to necessitate uniting, and some fundamental facts concerning the behaviour of bees must be known to the beekeeper to make his operations a thorough success. If uniting is done during a honey-flow there is less danger of loss of bees by fighting; and a fact which must be duly considered is that every colony has a distinctive odour of its own.

Precautions must be taken to entirely obliterate or substantially reduce each distinguishing odour. A bee laden with honey or

pollen from the fields and flying directly into other than its own hive is seldom molested, but a loafer trying to enter in the same way is promptly dealt with, and either thrown out or killed.

The colonies to be united may be shifted nearer to each other at the rate of perhaps several feet a day, always moving them in the evening, when the bees have ceased outdoor work. If colonies from a distance apart were placed side by side at once, all the flying bees would go back to the old location and thereby be lost.

Unite in the evening. Smoke the bees in both hives vigorously until they are entirely disorganized, then shake both lots in front of the hive you wish them to occupy. The queen desired to be kept should be caged for a day or two as a safeguard for her life.

An easy method, and one I have continually advocated, is to lay a sheet of newspaper over the frames of one hive, and then place the other hive bodily on top of this. Punch a few small holes through the paper to give the bees a lead, and in a short time they will gnaw their way through and unite peacefully. In this method the hive that is placed on top may be shifted from a distance, always in the evening, and placed directly in position over the other one.

SWARMS.

Uniting two swarms to make one strong one is an easy matter, as, during swarming memories of old locations are soon lost, and the bees, being full of honey, may be placed in any position the beekeeper wishes.

It is a frequent occurrence for two or more swarms to unite of their own account, thus proving they are demoralized for the time being. Swarms may also be introduced to established colonies without much trouble.

ROBBER-BEES.

When there is very little or no honey-flow bees are liable to rob other colonies, and at this period care should be taken to put all combs, honey, &c., in safe keeping from the bees. Autumn is a particularly bad time for the apiarist, and such small things as feeding or manipulating other colonies will often incite a whole apiary to turn out on the war-path. When this occurs all operations with the hive should cease. The entrance of the colonies which enemy-bees are robbing should be contracted. Grass or weeds should be thrown against the entrance and sprinkled with water. Should bees persist in robbing a certain hive, lock that hive up for a day and shift it, and in its place put an empty

hive with a bait of honey inside, allowing the bees to enter through a bee-escape only. In this way robbers may be caught and destroyed.

WINTER STORES.

Do not fail to determine the quantity of stores available in the hives for winter consumption. Experience has taught keen students of apiculture that a plentiful supply of winter stores is sound economy, and I advise that about 30 lb. of pure honey be left in each hive. There are occasions when late swarms do not gather sufficient for their preservation, and then they must be supplied with clean, healthy honey, or fed with sufficient sugar-syrup. Never use honey from an unknown source.

FOUL-BROOD.

Always keep a lookout for this disease, and when found either destroy the colony altogether or cure it by the well-known McEvoy treatment. A leaflet on this disease will be supplied free of charge on application to the Department.

EXTRACTING.

The end of the extracting season is now very near, and possibly some beekeepers have finished this work.

A reminder to thoroughly clean all utensils used and so preserve them as long as possible will, with some, not be amiss. The uncapping-knives especially should be washed with warm water and put away oiled. Clean the extractor and tanks thoroughly with hot water. It must be remembered by beekeepers that honey is a delicate article of food, and should be treated as such.

THE GARDEN.

W. H. TAYLOR.

VEGETABLE-CULTURE.

MANY losses occur through planting out of season, and also through putting out bad plants. One can but make the best use of the seasons as they come and go. We cannot alter them or change the nature of plants. One's wishes must be subverted to the possibilities of the time. If it is too late to plant certain things our wishes will not alter the fact. Better plant or sow something else. Wrong varieties are sometimes planted, as in the case of

cauliflowers. There are two main classes of these — the quick-heading varieties and those that take a longer time. The former class includes such varieties as Early London and Early Snowball. The use of these is to provide the first crop in spring. They give small heads, and are very easily forced into throwing heads prematurely, when they are useless, being too small. Such should be grown only when conditions for growing are good—namely, in early spring. Even then there is some risk of failure. If they are grown in summer and the summer proves dry, they are very unlikely to succeed, and even in a good growing summer some of the plants are sure to bolt. The other class comprises the large-headed kinds — Veitch's Autumn Giant, Metropole, and others. These are longer growing. They seldom head prematurely, unless in an abnormally dry season. Even then it is not so much premature heading as a failure of growth. Intermediate between these two classes there is another not usually recognized. Early Erfurt is a type which takes longer than the true earlies, but less time to mature than the true giants. It seldom bolts. Improper or bad plants would be such as have stood too long in the seed-bed. These have become semi-starved, and are very prone to bolt when put out.

The early supplies of cauliflowers are obtained by sowing at the end of March or early in April. Note particularly that it is dangerous to sow earlier than the last week in March, because with a little too much autumn growth the plants bolt. Sowing should not be later than the time stated (early in April) or they will not make growth enough. Some people who are troubled with frost grow them in boxes. This is quite a good practice if properly carried out. The plants so raised, however, are very prone to bolt unless pricking off is promptly done and the plants are kept growing. It would be preferable to sow in the ground and cover with shallow frames, taking care to remove the lights on all possible occasions.

For the earliest cuttings sow some variety like Early London and Snowball. These give small heads, and some will probably bolt early, but very few will go wrong if treatment is good. So-called Early Erfurt sown at the same time would come into use after the varieties mentioned. I do not remember seeing any plant of this variety bolt. I suppose they will if treatment is not good, but it is not their nature to do so. If at the same time seed of a true giant variety is put in, it might be expected to be a little later coming into use than either of the preceding types. Thus, allowing for a little difference in various localities,

early varieties would be in use about the third week in October, second early by the end of November, and giants about Christmas. This is my experience in the Wellington Province.

Cabbage seed, *lettuce*, and *onion* should be sown during the last week in March or the first in April. There is not much difference in the time of varieties of cabbage coming into use. Still there are some true earlies which are hearted before others sown at the same time. The difference of time is of considerable importance to growers for market, but of little moment in a private garden.

Except where it is important to understanding these articles I find it best not to specify kinds by name; it leads to useless correspondence, is unfair to seedsmen, and would prevent many useful varieties being grown.

Onions sown are mainly for transplanting. At least this is so in most places, and it is the only way to obtain large specimens. Autumn sowing has, however, other advantages. One is to secure good bulbs of the keeping varieties for early use and early market. In some places it is not by any means certain that good bulbs will result from spring sowing, nor do they in many places mature quite so early as those sown in autumn. For market purposes good bulbs are most profitable, as, if not too large, they realize better prices than small, and, what is just as important, they cost less to handle. On the other hand, it is not usual for those from autumn-sown seed to keep as long as those from spring-sown. Some judgment must therefore be exercised as to the extent of the sowing. Autumn sowing should be seldom allowed to supersede spring sowing. In the district where I am now working (Hawke's Bay) I find a difference. Dry summers are usually experienced, and in cases that have come under my notice spring-sown crops fail, or at best produce very small bulbs, while autumn-sown crops, even when not transplanted, keep fairly well and develop useful and well-sized bulbs. It seems to me that this is the correct procedure for this district.

Turnips.—Sow at once for the winter supply. This will be the last sowing until August, therefore put in a good breadth according to requirements. Sow a white for first use, and Golden Globe or Yellow Maltese for late use. This is the correct purpose of the yellow-fleshed varieties. They are not good in summer, but in winter they are of excellent flavour. They appear to keep sound longer than the white-fleshed varieties. Turnips should not be thinned to produce large turnips, for they are not as good for table use as those of medium size, and besides are wasteful in the space they take up. Sow in broad drills, and thin moderately,

so that each plant stands clear, but several deep in the row. When drawing for use the rows are further thinned by going over them repeatedly, drawing out each time those that are ready. This method economizes space, and therefore labour, besides securing produce of the proper size. It would be useless to plant now anything in the way of cabbages, &c. Those put out require some attention in the way of cultivating to keep weeds down, and moulding up when sufficiently advanced.

Broad beans may be sown if required early. They tend to get rather tall if sown now, and the first beans may be rather far from the bottom, because they will not set until the weather is warm enough, but it is an established fact that the earliest beans are obtained by sowing now. The usual practice is to sow in June, and the growth is then less high before the first beans set, a matter influenced by locality to some extent.

When the ground becomes moist from autumn rains it is time to prepare fresh ground for vegetable-culture and to improve old ground. The extent of preparation necessary or advisable is ruled by the character of the soil. Alluvial flats seldom require more preparation than deep digging. Where the subsoil is hard it should be broken up to such depth as can be afforded; 30 in. is a useful depth. This is done by trenching. The trenches should be worked so as to keep the top soil still on top. Turf on an old pasture is usually very tough and takes some time to decay. It is advisable, therefore, to strip it off and bury it below the top spit. This renders the work of trenching easier, and the top spit is more readily brought into a fit condition for cultivating.

Old gardens require retrenching; the more frequently this can be done the better. In this case the top soil, being exhausted to some extent, should be put to a lower level; and if the soil was previously well trenched and manured the material brought up will be comparatively rich. When trenching, whether old soil or new, it is important to trench in at each layer manure or vegetable matter of any kind that it available.

Tomatoes.—Experience with tomatoes is of a unique character this season owing to the long-continued drought. At the time of writing there has been no effective fall of rain in these parts since May last. Our ground lies high and exposed, and is excessively dry. In spite of these apparently adverse circumstances our tomatoes are doing well. The crop is a fairly good one and the fruit excellent, with no blight. Our plants have not been watered since they left the seedling-boxes, not even when planted out. This is in accordance with my usual practice, and the soundness of the policy is admitted by all visitors who see the plants and

fruit; nor has any manure been given. Last season the ground they are growing on was excessively manured with blood and bone for potatoes; but I have given none this season.

I have been several times asked why tomatoes drop blossoms without setting fruit. I am unable to say what is the cause in all cases, but it is a fault inherent in some varieties. Earliana I find prone to drop its blossoms, leaving sometimes but one fruit on a truss. That one is sometimes very fine. Such varieties should be avoided. A profitable variety is one that sets practically all its fruit, so as frequently to require thinning; and it should also set the first truss, as these give the earliest fruit.

Lawns.—Autumn is the best time to sow down a lawn, and in some circumstances it is the only time it can successfully be done. The ruling factor is, of course, local conditions of soil and climate. The first statement remains unaltered in a majority of cases. Autumn sowing enables the grass to make a good sward before the spring winds occur, which often make it impossible to get a good sward from spring sowing. The amount of preparation required depends on the nature and condition of the soil. It is usually best to trench at least 18 in.; and unless the soil has been fallowed to kill weeds it is best to bury a few inches of the actual surface soil, because it is more than likely to be full of weed-seeds. With the exception of the few inches mentioned, the top soil should be kept on top. This is effected by turning the top spit neatly upside down, leaving it on the future surface. The work is done by throwing out the top spit from a strip about 30 in. wide and digging up the bottom of the trench so formed, leaving it in its original position. The soil should be afterwards well worked till it is in fine tilth and well rolled, and should be brought to an even surface. Seed is to be sown at the rate of from 4 to 8 bushels per acre. The larger quantity for a quick lawn, and between the two quantities mentioned in any case if the soil-conditions are not of the best. Lawn-mixtures of seed are made up by seedsmen. On no account sow cheap mixtures; and when buying stipulate that there must be no rye-grass seed in the mixture. Weeding lawns should be also done in autumn, as soon as the soil is moist enough to work easily. There is no way of ridding lawns of weeds that is so effectual as digging them out. A strong fork with tines worn down somewhat is the best implement. After the weeds are dug out the lawn should be rolled, and then a top-dressing of clean soil given. Rake this over so as to fill any holes made in digging the weeds, and then sow a little seed on bare places and scratch it in. Roll again when top-dressing is quite dry.

THE FLOWER-GARDEN.

The most important work at this time is planting spring-flowering *bulbs*. These, of all classes, should be got in as soon as possible. It is even more important that any to be transplanted should be attended to at once, for whereas those lifted and stored remain dormant for a long time, those left in the ground will be active, and it does them no good to move them when the roots have run much. The fact that they are making roots is an indication that those lifted should be planted.

Chrysanthemums are making their last growth. Tie them securely to stakes of suitable height, as it becomes very difficult to tie them effectively when the flowers begin to open. Thin the buds to some extent to secure fair blooms. It is not necessary to thin severely, but they are always improved if this is done moderately.

Seed-sowing in boxes should be completed very early in April.

Mr. Primrose McConnell, Manager of the Ruakura Farm of Instruction and a valued contributor to the *Journal of Agriculture*, has resigned from the service of the Department, having been appointed to control the training-farm being established by the Dilworth Trust in the Auckland Province. The object of the Trust is to create a thoroughly up-to-date farm, where boys after leaving its parent institution will be properly trained in the most intensive methods of farming. The farm buildings are to be thoroughly up-to-date, and will be equipped with electric power and light. Eventually all the stock of the property will be pedigreed. Mr. McConnell will have a unique opportunity to bring into being a valuable demonstration farm for the Auckland Province, where the students will have full opportunity to become expert farmers.

So far as New Zealand is concerned the war has had comparatively little effect on the grass-seed trade. The very high prices of our main seeds have been due almost entirely to the local unfavourable season. The most unusual feature of the trade has been the very large importation of perennial rye-grass seed, well over a thousand tons having been already landed and sown down. As a usual rule New Zealand produces more than sufficient of this seed for her own requirements. It is more than probable that the price of rye-grass seed will advance, due to the almost certain extension of cereal cropping and the inclusion in the seeding of the grain crops of a grass-mixture, in which rye-grass will occupy a prominent position, for the purpose of providing subsequent pasture. The demand for rye-grass within the next few months should therefore be considerable. This while the supplies are smaller than usual.

THE HEMP INDUSTRY.

W. H. FERRIS.

ENCOURAGED by the improved market position of phormium-fibre an increased number of mills have been in operation—in fact, nearly every stripper in the country has been occupied except those in a few districts where the natural supplies of water having failed, owing to the prolonged dry spell, milling has been impossible. With the good rains generally experienced this month, however, these mills should be now in operation. A considerable increase in the fibre-output will probably therefore be recorded when this month's figures are available. This season's output will not, of course, compare with that of some past seasons, due largely to the poor market values ruling in the earlier part of the season, and in a minor degree to several disastrous fires in flax areas which took place in the summer months.

The quality of the hemp milled in February was on the whole very satisfactory. The larger mills maintained a good standard, but the work of some of the mills which recently resumed operations was responsible for a decided increase in low-pointed fair parcels, these mills having apparently not yet got into their stride. The majority of stripper-keepers have been doing fairly good work, but with the sound leaf generally available there should be a much higher percentage of the higher-quality grades. Colour has been weak in many cases, especially in the lower grades, occasioned probably by poor bleaching-conditions or by the tendency to rush the fibre through the bleaching process, thereby not giving it sufficient time to bleach effectively.

With the excellent prices now offering for fibre there is a common tendency to aim at quantity rather than at quality. It is the low market that encourages good milling-work rather than the high one.

THE SUTTIE AND WYNYARD AUTOMATIC SCUTCHER.

THE recommendation of the Hemp Bonus Committee—that the sum of £750 be paid to Messrs. Suttie and Wynyard as a bonus in connection with their improved flax-scutching machine in consideration of their reducing the royalties thereon from 3s. 6d. to 2s. per ton of fibre treated—has been given effect to. In consideration of the payment by the Government of £750 in cash Messrs. Suttie end Wynyard have undertaken to supply their automatic scutcher on license terms at a price equal to not more than the cost of manufacture plus 25 per cent., the patentees having the right to make it a term of such disposal that the purchaser shall pay to them a royalty not exceeding 2s. on each ton of fibre treated by the machine.

COMMERCIAL INTELLIGENCE.

THE WORLD'S MEAT SUPPLY AND DEMAND.

HOW TO DEAL WITH IT.

J. ALLEN.

THAT there is a shortage in the world's meat-markets is an acknowledged fact, and while our farming community have been devoting almost all their energies to the production of butter by the importation of dairy bulls, testing the cows, and the Government by grading the butter, the production of beef has been altogether neglected as a science, and nothing whatever has been done to educate the grazier in regard to the cost of production. Chicago is the world's greatest market of live-stock, and ten years ago their four-weeks average sale in the Chicago yards was a million and a quarter of cattle, hogs, and sheep, when, besides supplying their own market, they were exporting largely to Great Britain and the Continent. Now they have to draw largely upon the Argentine for local demands. This is caused largely by the increased population of the United States to 100,000,000, and the educated tastes of some of the Continental countries to meat-eating, and also by the wheat-production of the North-west.

The buffalo was superseded by the cattle-rancher, and now the rancher has to give place to the wheat-grower, and such is the enterprise of the rancher that he has crossed the buffalo with the domestic cow (producing what they have named the cattelo) to try in that manner to produce an animal that in winter will scratch away the snow to obtain his food. We learn that in the United States alone eight million calves are killed annually to supply their demand for veal, and beef is worth about £3 sterling per 100 lb. dead-weight. For years the graziers have been studying how to produce "baby beef." Many of their cattle are fed up to a great weight—800 lb. at eighteen months old—and this meat commands a higher price. In this particular the four- and five-year-old beef-producer loses considerably, as a choice two-and-a-half-year-old well-fattened steer or heifer will realize very often within 10s. of an animal at least 300 lb. heavier and two years older.

After many years' successful butter-production, testing all my heifers and cows in the early "eighties," I turned my attention solely to beef, and was not long in learning by experience that a three-year-old could not retain his fat and grow on the same grass that a yearling would thrive on. When travelling through the United States and Canada I visited several Government experimental farms, and became very curious to know their results, and I learned that the steers they exhibited to us were weighed every week, while an accurate record was also kept of the weight of all the food supplied to them. The result they gave me was that, excluding the birth-weight, the steer maintains a practically uniform rate of gain until he becomes two years old. But the cost of producing the gain the second stage—that is, from two to three years old—is about double that of the first, and for the third the cost is about three times that of the first.

The loss sustained by New Zealand graziers by keeping steers to three, four, and five years old is incalculable; but I hear them say continually, "They pay all right, and we are satisfied." But they do not put down the fact that they could fatten double the number on the same feed if younger.

That the prices will not recede is a certainty, and our graziers should try and produce beef at the earliest maturity. To do so the owners of second- and third-class land, who are now buying and grazing calves and yearlings in store condition till three, four, or five years old, would make more money by breeding fat calves. Expensive breeding-cows are not necessary, but cows should be selected with a strong fusion of Shorthorn blood, preferably large and roomy, and with a tendency to "beefy" conformation, and then if these animals are bred to a good Shorthorn the requirements will be met. Growth is the great desideratum,

and if the calf is kept in fair growing-condition the turnip-grower and first-class grazier could purchase them when from six to nine months old at, say, £3 each; and then, retaining all the milk-fat on them, turn out top-quality beef under three years old. It is a recognized experience, moreover, that heifers and cows fatten on inferior feed to that required by steers, and are useful stock for cleaning up rough country. I always preferred selling my steers at two and a half years old, and so avoiding the third winter, during which time it was so hard to keep the condition on, compared with eighteen-months-old steers.

The most favoured cattle in Canada are the Scotch Shorthorns.

I saw Babton's Champion, sold at the dispersal sale of the late W. S. Marr, realize twelve hundred guineas. Canadians were there, but they were outbid by the Argentine buyers; but still the Canadians have been to the fore. It was Mr. W. D. Flatt, a Canadian, who imported the unbeaten bull Choice Goods and also Spicy Marquis, which animal secured champion as a two-year-old at Toronto, and in the four-year-old and over secured first and champion in a strong ring at the Dominion Show of Canada in 1904.

At the Government experimental farms in both Canada and the United States experts are employed who give demonstrations on beef-production not only to the hundreds of resident students, but also to great numbers of the surrounding farmers and their sons. These lectures go on for three or four days during the winter months, when farming is at a standstill. The fattened animals are brought before the students, and the different parts are pointed out, indicating where it is essential to produce the beef on the animal in order to secure the highest prices. Then the animal is slaughtered, and in the presence of the whole assembly the carcase is cut up and weighed out, and the relative values shown, together with the difference in value of a steer that is heavy in the fore quarter against one well proportioned all over. I have watched the judges of fat stock at the Canadian shows, and invariably the hand first goes on to the porter-house steak, the most valuable part of the animal.

The New Zealand Government would do well to introduce or help the importer by free quarantining of some of these cattle to improve our beef stock. The Canadian contends that these cattle mature a year younger than others, and they mate even their purebred imported cattle at eighteen months old. This produces good milkers to give the well-grown fat calves.

Such is the advancement in present-day agricultural methods that a calf is grown to, say, 1,000 lb. in half the time that it took to do it twenty years ago. Most up-to-date farmers try to finish their stock more quickly. To reduce it to figures, we will say a farmer keeps eighty steers, and if he takes four years to prepare them for market he would sell twenty per year; but suppose he finishes them in two years he would sell forty per year, according to simple arithmetic; and if they are finished in two years he would keep at least 160 on the same feed and have eighty finished cattle to sell every year. This shows clearly that by early maturity the world's beef-production could be doubled with the same amount of feed.

THE WORLD'S WHEAT-SUPPLY.

ACCORDING to reports of the International Institute of Agriculture the yields in 1914 of wheat, rye, barley, and oats in nearly twenty countries of the Northern Hemisphere are all considerably below those of 1913. Reporting on the British and Continental wheat-supply the London *Grain, Seed, and Oil Reporter* remarks, "The requirements for home consumption in United Kingdom, Germany, Austria, Belgium, Denmark, Spain, France, Italy, Turkey, and other countries are about 49,000,000 tons. The crop of last year was 31,250,000 tons, and the imports to the end of October were 2,862,000 tons, thus leaving a difference of 14,888,000 tons to be supplied."

"The world's wheat crop," says Beerbohm's *Evening Corn Trade List* of the 24th December, "amounts to 453,300,000 quarters (qr.=480 lb.), and thus shows a large deficiency compared with last year's record crop, and is somewhat smaller than that of 1912, but compares favourably with all previous years, when, however, the consumption was smaller than at present. The greater portion of the shortage is in the European quantity, the yield in non-European countries being the largest on record, excepting those of the past two years. The total wheat crop of the

world in 1914 was 452,300,000 quarters, against 494,050,000 quarters in 1913 and 462,550,000 quarters in 1912."

"In England and Wales there is an increased area planted to wheat of about 10 per cent.," says the *Journal of the Board of Agriculture*. "Ireland's wheat harvest of last year was very satisfactory, the yield being 1,415,221 bushels from 36,913 acres, against 1,295,256 bushels from 34,000 acres in 1913."

"The area sown to wheat in the United States," reports the Department of Agriculture, "is estimated to be 11·1 per cent. more than the revised estimated area sown in the fall of 1913, equivalent to an increase of 4,135,000 acres, the indicated total area being 41,263,000 acres."

The estimated wheat-yield of Canada in 1914 was 158 223,000 bushels, against 231,717,000 bushels in 1913.

Argentine expects to have 3,616,000 tons available for export this year out of a total production of 5,270,000 tons.

WEST CANADIAN MARKETS.

THE BUTTER TRADE.

E. CLIFTON.

THE State of Oregon is a large producer of butter. It will be quite understood, therefore, that considerable resentment was manifested when butter from New Zealand appeared on the market of the City of Portland in that State. This was so strongly manifested that there was considerable difficulty in placing the produce on the market. However, prices were favourable for the importation, and packers —that is, produce-merchants—who had received the consignments were accused of offering the butter for sale in wrappers misrepresenting the country of its origin —that is, it was put on the market as manufactured in Oregon, while, as a matter of fact, it had been imported from New Zealand. In Oregon the public is safe-guarded by many enactments relative to food products. Among these is one that requires all butter that is imported into the State to be definitely marked with the name of the country of origin. The authorities administering the Pure Foods Act at once became active. The arrival of steamships and trains were watched, information was obtained on all foreign butters that came into the State, the location of its storage was ascertained, and when the owners required to dispose of New Zealand butter an Inspector of the Foods Commission supervised the operation and maintained a close watch on all withdrawals of foreign butters from the cold storage. It was claimed that by this means our butter was not placed on the market unless it was enclosed in the wrapper prescribed by law, and in our case bore on it the name "New Zealand." This was a particularly fortunate condition for New Zealand. It gave full advertisement of the quality of our butter, and had it not been for the changed relation of commerce during the past few months it is assured that a large volume would have been imported into the State of Oregon during the month of November of last year extending into April of this year. In 1913, 120,000 lb. of butter reached Portland, in Oregon, from New Zealand. Prices then became equal for the imported and locally made butter. It was no longer possible to introduce more from abroad. With the prices that are now being obtained for butter in New Zealand it is most improbable that there can be large importations.

It is, of course, recognized that the activities of the authorities of the Pure Foods Commission were not of intention operating in the interests of New Zealand. It was far more to assuage the irritation of the Oregon farmer, who objected to the presence of butter from abroad. This has, however, brought about the appreciation of the high quality of our New Zealand butter, and has effected an entirely different end to that anticipated would be brought about by those who wished to arouse the interest of the Commissioner.

The *New York Produce News* writes last January, "that reliable figures showed there were in store, cold and otherwise, on 1st December, 8,000,000 boxes of apples. About 1,000,000 was sold in December. The year started with 7,000,000 boxes in hand, and markets were dull."—*T. W. K.*

ANSWERS TO CORRESPONDENTS.

CORRESPONDENTS are requested, when desiring information through the Journal in regard to disease in animals and plants, to forward, where possible, affected specimens, in order to facilitate a correct diagnosis of the trouble and to ensure the best advice. In stating a question the most complete descriptive details should be furnished.

Correspondents desiring information in regard to manurial treatment of soil are requested to fill in and forward the prescribed form—"Application for Advice as to Manurial Treatment of Soil"—obtainable from any office of the Department in the Dominion.

In every instance a question to which an answer is desired in these columns must be accompanied by the full name of the inquirer, not necessarily for publication, but as a guarantee of good faith. The question should be written only on one side of the paper.

BOTS IN HORSES.

J. H. JONES, Scargill:—

As I have a horse suffering from what I believe to be bots in the stomach, will you kindly forward a remedy for removing same? I might state I found in his droppings what appeared to be the larva of a bot-fly, and he is very much tucked up. He eats ravenously, and is always stamping his hind feet on the ground.

The Live-stock and Meat Division:—

Yes, it is probably larvæ of the so-called bot-fly you found. In summer these leave go their hold on the stomach and are passed out in the dung on to the ground, where after a certain period they hatch out into a fly, and commence the whole business again by laying eggs on the insides of the horses' legs, &c., where the horse can get at them. The stomach consequently is pretty free from them now, so they are not causing the trouble with your horse. He has probably got intestinal round worms. Give him a drench composed of 15 grains thymol dissolved in 1½ oz. of turpentine mixed with a pint of raw linseed-oil. If you see any worms pass repeat the drench in a few days' time.

STOCK INFESTED WITH LICE.

H. B., Apiti:—

I noticed this past season that almost all cattle, horses, and pigs were smothered with lice, and I washed my cows with kerosene, lysol, and sheep-dip at various times, but found it a lot of labour to wash fifty cows and fifty yearlings three or four times, and then there were still plenty of lice left. What is the best plan and least labour to get rid of them? I was told that a little grease or oil poured along the backbone of a beast would destroy lice, as they make a journey across the back of the animal once a day. Is there any truth in this statement?

The Live-stock and Meat Division:—

It certainly is troublesome to dress such a number of animals, but there was no necessity to do it so many times. The first dressing will kill the lice, but will not do any damage to the eggs, or "nits" as they are termed. These hatch out in about six or seven days, so that another dressing in eight or nine days' time

is necessary to kill the newly hatched lice before they begin breeding. Any coal-tar sheep-dip, used in the same proportions as for dipping sheep, will destroy the parasites. Oil, if you add sulphur to it, might do good if smeared down the back, but we have no knowledge that lice journey as stated. We should say not.

WORKING-BEES DYING.

VICTOR WATSON, Christchurch :—

I have a number of bee-boxes, and this year I find a number of dead working-bees outside the boxes. What is the cause, and what can I do to prevent them ?

The Orchards, Gardens, and Apiaries Division :—

Dead worker-bees outside the hive points to fighting, so probably these hives have been attacked by robber-bees. When the honey-flow has stopped, robber-bees often attack hives and endeavour to steal honey. The remedy is to contract the entrances of the hives being robbed, thus giving the guards inside less space to watch over. If the robbers still persist, throw grass over the entrance and keep this sprinkled with water.

TROUBLE WITH HARES IN ORCHARD.

T. H., Hapuku, Kaikoura :—

Hares are barking my young apple-trees. Is there any means of preventing this besides netting ?

The Orchards, Gardens, and Apiaries Division :—

The only alternative to netting to prevent rabbits from damaging your fruit-trees is to paint the stems of the trees with some preparation obnoxious to these animals. Mutton-fat to which a little kerosene has been added has given satisfactory results in some instances. Melt the fat, add a little kerosene, and while warm apply to the stems of the trees with an old paint-brush.

COWS CHEWING BONES.

A. B., Waimarino :—

What do milking-cows need when they are very fond of chewing wood and bones ? They have plenty of rock salt. I may mention that young cattle thrive well on the same land and are not addicted to bone-chewing.

The Live-stock and Meat Division :—

The real cause of the trouble is the want of phosphoric acid and lime in the system. The condition has been very prevalent during the last season, due no doubt to want of moisture, the salts not being liberated in sufficient quantity for proper plant-growth. One-ounce doses of syrup of compound phosphates and iron (Parrish's Chemical Food), given twice a day, will materially help. The reason why the young cattle are not affected is because they have not the drain upon the system that the milking-animals have. Your pasture land should be top-dressed with basic slag or some similar fertilizer.

ANGORA GOATS AS CALIFORNIAN-THISTLE ERADICATORS.

"INQUIRER" : –

What price are Angora goats, and what value of hair would be shorn off yearly ? I understand that they will eat Californian thistle. If a few of these goats were put in a paddock where this thistle was growing, would they eat the thistle in preference to the grass ?

The Fields and Experimental Farms Division :—

The price of Angora goats varies from two to five guineas. The quantity of hair shorn yearly would vary according to climate. It might have an average value of 5s. per animal, but there is no demand for it in New Zealand. Goats

will eat Californian thistle, but are really browsers by nature, and there is no vegetation they will eat in preference to leaves and twigs of bushes, blackberry, sweet-brier, &c., and many bushes and weeds that are considered poisonous to other ruminants. They would probably eat the Californian thistle in preference to grass.

TROUBLE WITH MILKING-HEIFER.

W. A. EDGE, Awarua Plains:—

Would you kindly supply me with information for treatment of the following case? I turned out a heifer (a first-calver) last season perfectly dry, and when she came in this season she milked all right for seven days, and then the milk gradually thickened in the four quarters of the udder until it was like matter. The treatment I gave was as follows: I rubbed with castor-oil and kerosene, and used the milk-siphon, as nothing would come without this. The milk is now back in two quarters with a good flow, and thick stuff comes out of the other two quarters.

The Live-stock and Meat Division:—

The condition is apparently mammitis, and, owing to all four quarters being implicated, I should say that it was the ordinary acute rather than the contagious type of the disease. In these cases treatment should consist of giving the animal a fairly large saline purgative. A drench composed of Epsom-salt 12 oz., nitrate of potash 1 oz., with ½ oz. of ground ginger should be given in a quart of thin oatmeal-gruel when first the disease is noticed. This may be followed up the second day with 1 oz. doses of nitrate of potash, given twice a day in a little water. The udder should be fomented three times a day, and it should be done thoroughly, with a large piece of old blanket and water as hot as you can bear your hand in, for at least a quarter of an hour. When dry rub into the affected quarters a liniment composed of extract of belladonna 2 drams, glycerine 2 oz., soap-liniment to 10 oz. Keep the udder thoroughly stripped of all secretion. Do this before fomenting, and again afterwards, when you will find quite a large quantity come away. If you use a teat-siphon see that it is properly sterilized before each insertion. It is possible that the mammitis may be of the contagious type, so I should advise you to milk her last and keep her apart from the main herd for a time.

AN INSECTICIDE FOR PESTS OF TURNIP.

"COLONIAL," Pukekawa:—

Does soaking turnip-seed in kerosene or turpentine keep the fly or other insects from taking the young plants? Would soaking for a day or two in either of the above have any effect on the germination of turnip-seed?

The Fields and Experimental Farms Division:—

The soaking of turnip-seed in kerosene or turpentine does not, in our opinion, prevent the turnip-fly or other insects from taking the young plants, nor does soaking the seed for any length of time improve its vitality. On the contrary, the tendency would be to injure the germinating-power. The only treatment known to us as being effective for the turnip flea-beetle is the following: Thick sowing; use of a forcing manure like superphosphate or a good turnip-mixture to force the seedling quickly into the "rough leaf," in which stage the fly cannot attack it. Where the turnip area is small, kerosene emulsion, soot, powdered lime, or sulphur will be found effective as a spray. Keep down cruciferous weeds, such as wild mustard.

TROUBLE WITH YOUNG DUCKLINGS.

"FROGMORE":—

I have a few Indian Runner ducklings, and I find they take some sort of a disease in their legs and cannot use them at all. I have tried Elliman's embrocation, also painkiller, with no effect. Is there a remedy, and what is the cause? It is certainly not water.

The Live-stock and Meat Division :—

We regret that you have not supplied details as to the class of food supplied, the age of the birds, and the conditions under which they are being kept, as without these particulars it is difficult to form an opinion as to the cause of the birds being affected. This trouble may be brought about in many ways. As a general rule, however, it is due to the birds being in too high a condition, whereby the body becomes too heavy for the tender legs to support. Especially does this apply when the birds are confined and have not sufficient water to bathe in. Sometimes this condition is due to a stampede. The mere fact of the birds trampling on each other in a corner, or anything that will injure the back, such as being crushed through a small hole into a coop, &c., will have a tendency to weaken the legs. After correcting matters as above outlined we shall be glad to hear further from you as to the improvement or otherwise of the birds. Should more birds become affected kindly supply details as mentioned above.

POTATO-GROWING.

"SUBSCRIBER," Tuakau :—

I intend putting in Gamekeeper potatoes in the middle of July. What amount of seed per acre do you advise ? Should I let the seed potatoes sprout, or put them in straight away ? Do you advise cutting off a small end of a potato or putting them in whole ? I intend spraying three times. Could you tell me what quantities to mix, and cost ; also, should all three sprayings be of the same mixture and strength ?

The Fields and Experimental Farms Division :—

11 cwt. per acre of medium seed is about the correct quantity to use, and the potatoes should be allowed to sprout before planting. Whole potatoes have been found to give the best results. For spraying, Bordeaux mixture should be used, made as follows : 4 lb. bluestone, 4 lb. lime, and 40 gallons of water. The first spraying should be when the crop is 9 in. to 10 in. high, the second when the plants are coming into flower, and the third when in full flower. The spray should be the same strength in each case.

THE WHEAT-WEEVIL.

"WEEVIL," Penrose :—

My feed-room and loft (containing loose chaff) are swarming with weevils, which must have been introduced some time ago in some dirty bags of wheat. Could you advise me of any practical means of getting rid of the pest ?

The Fields and Experimental Farms Division :—

The surest means of treatment against the grain-weevil is fumigation, either with hydrocyanic-acid gas or carbon bisulphide. Such treatment can, however, only be carried out when the premises can be made airtight. In your case it will be necessary to remove the material that is infested and thoroughly clean out the places where the weevil is present. The loft should then be well sprayed with some light oil, such as petrol, special attention being paid to all cracks and crevices. Proper precaution will have to be taken to guard against fire. Spraying with lysol, 1 part to 15 of water, would also be found fairly effective, but might have to be repeated several times if infestation is bad. If you have much material, such as chaff, &c., badly infested it should be piled up in a heap and have carbon bisulphide placed in soup-dishes put on top and the whole covered with a tarpaulin for some hours.

POTATO-DISEASE.

"POTATO-GROWER," Wyndham :—

There has appeared in this district a partial failure of the potato crop. The potato-seed failed to grow any stalks, although they grew roots and formed small potatoes around the set. The seed-sets are quite sound after being in the ground

two to three months. Southland has been very wet this year, but I do not blame the wet for the failure, as there are some good crops in the district. The fault lies with the seed, as the potatoes kept for household use never sprouted in the bags as in former years. Can you explain the cause of the trouble?

The Fields and Experimental Farms Division:—

Without further information, more especially respecting the condition of the seed, of the resultant plant, and of the soil, it is difficult to form a true estimate of the trouble. However, from the facts as known, it would appear as though the failure of the crop is due to deteriorated seed, together with poor growing-conditions—cold, wet, and generally backward weather, such as has obtained in Southland during the earlier half of the season. Variation in soil would also enter in, and this factor, together with good seed of high vitality, would probably account for the presence of good crops in the locality. The importance of good seed is here brought out if, as we suppose, the trouble is merely physiological, and not pathological. The sprouting of seed in boxes is a commendable method under such conditions, as is also change of seed.

BUTTERMAKING.

I. Anderson Boyd, Pukipuki, Hapuku:—

I have a cow which has been in constant milk for four years. Her milk is rich and the cream thick. The butter has only taken a few minutes to churn until this last week, since when we cannot get the butter to come at all. Could you advise reason and remedy?

The Dairy-produce Division:—

When the lactation-period has been extended beyond a normal length the churning of the cream at times becomes more difficult, and in some cases is due to the extra hardness of the various fats. It is just possible, however, that you may be experiencing some difficulty which is not due to this cause, and we would suggest that the fat-percentage of the cream be regulated to about 40 per cent., and that the cream be churned at a temperature not higher than 55°; but 50° to 52° would be more suitable during the warm weather.

FAILURE OF PEACH CROP.

J. D. McKay, Pukehuia:—

I have two peach-trees planted from seedlings, beautifully shaped, and in cultivated ground all the time. They are six or seven years old, but show no signs of flowers or fruit. What would you advise doing?

The Orchards, Gardens, and Apiaries Division:—

In growing peaches from seedlings the fruiting-qualities of the trees cannot always be depended on. It often happens that the trees turn out to be non-bearing, and this is apparently the case with your two trees. Your best plan is to work them over with a variety suitable for your district. The Orchard Instructor for your district, Mr. J. W. Collard, Whangarei, has been asked to advise you regarding this.

BEE-CULTURE.

"Beta," Mount Barker, West Australia:—

1. I notice Mr. Hopkins states that he knows of no remedy for stings. I have found three—honey, spittle, and eucalyptus. Possibly permanganate of potash would also neutralize the poison, as it does in snake-bite.

2. He suggests the possibility of working a hive for wax chiefly. In that case would he not dispense with comb-foundation entirely, or use starters only?

The Orchards, Gardens, and Apiaries Division:—

1. We do not know any positive cure for bee-stings. Possibly the remedies suggested would be effective in some instances. Common washing-soda applied to the spot is also sometimes effective. When stung severely a strong draught of brandy taken internally is useful to stimulate the heart's action, as persons with a weak heart are likely to suffer collapse.

2. Last season we contracted with a beekeeper to experiment working a few colonies for wax only, but his report was "quite unsatisfactory." The colonies should only be given starters of foundation or plain wax and not full sheets of foundation. When removing the wax for melting leave two frames of brood to hold the bees, otherwise in many cases they would leave the hive. We do not think it would pay in good honey districts, but may possibly do so where thick unextractable honey is gathered.

WINDGALLS IN HORSES.

"WINDGALL," Limehills, Southland:—

What is a good cure for windgalls in horses? I have a good mare which has soft windgalls just above the fetlocks, and I would like to get them cured, as she is a valuable mare. She does not do hard work, being driven only about twice a week.

The Live-stock and Meat Division:—

What are termed "windgalls" are really enlargements of the bursæ in connection with the flexor tendons of the fetlock joint, due to increased secretion of the synovia or lubricating-fluid they naturally contain. Treatment, except in the early stages when they first appear, is not much use, and if they are not causing lameness they are better left alone. Blistering and three or four months' rest will generally reduce them, but they return, as a rule, when the horse is put to work again. If your mare is young and the windgalls have only just appeared this treatment may be successful.

TOMATOES.

"SUBSCRIBER," Havelock North, Hastings:—

The blooms on my tomato-plants are many of them falling off at the joints. Would you kindly tell me the cause?

The Orchards, Gardens, and Apiaries Division:—

It is not stated whether the plants are being grown under glass or outdoor.

Under glass: When the flowers begin to appear the condition of the house should be dry rather than moist. Excessive moisture renders the pollen pasty and not so fit for distribution. It may also be caused by overmanuring and the plants making rampant soft growth. Note the effect on a plant of any kind that is starved for want of water or in poor soil, how freely it flowers and seeds, compared to one growing in a damp rich soil with strong foliage and few flowers. Remedy: Withhold strong stimulating manures and heavy watering till the plants are about 2 ft. high and flowering freely and setting their lowermost fruit.

Outdoor grown: There is generally very little trouble in this respect. Overmanuring by forcing too strong growth would be likely to produce such an effect. Do not plant too close. Cultivate frequently, and give them a change of ground, if possible, each year.

NEW ZEALAND AT THE PANAMA PACIFIC EXPOSITION.

WRITING under date of San Francisco, 15th February, Mr. E. Clifton, New Zealand Commissioner, says, "Our display in the Palace of Agriculture will be ready for the opening of the Exposition. There we have 12,000 ft. of space. I believe we shall have the feature of the Exhibition as regards food products under controlled temperature."

THE DOMINION'S EXPORTS TO BRITAIN.

COMPILED FROM MANIFESTS OF VESSELS SAILED DURING RESPECTIVE MONTHS OF CURRENT AND PRECEDING SEASONS.

Month.		Mutton, Carcases.	Lamb, Carcases.	Beef, Quarters.	Pork, Carcases.	Butter, Boxes.	Cheese, Crates.	Wool, Bales.	Wheat, Sacks.	Oats, Sacks.	Rabbits, Crates.	Hemp, Bales.	Tow, Bales.	Kauri-gum, Cases.
January,	1915	137,816	296,439	45,622	339	138,081	85,123	87,393	..	..	2,860	683	..	1,209
,,	*1914*	*231,766*	*464,185*	*30,424*	*33*	*150,492*	*136,086*	*108,742*	..	*500*	*2,851*	*15,234*	*4,306*	*11,133*
February,	1915	433,585	517,581	77,421	311	119,371	96,090	159,347	..	..	..	13,111	6,619	2,763
,,	1914	*354,190*	*334,207*	*14,100*	*3*	*86,570*	*59,532*	*127,372*	..	*4*	..	*3,709*	*633*	*7,607*
March,	1914	446,522	551,313	36,689	..	61,060	62,732	95,175	..	..	..	8,187	2,562	3,958
,,	*1913*	*86,224*	*210,166*	*7,428*	*250*	*47,560*	*59,844*	*49,661*	..	*115*	..	*12,552*	*7,662*	*4,043*
April,	1914	234,765	366,786	22,185	..	7,822	63,796	58,488	..	2,901	..	1,247	888	5,909
,,	*1913*	*303,937*	*647,948*	*16,834*	*457*	*11,358*	*52,934*	*61,988*	..	*300*	..	*9,049*	*3,351*	*3,889*
May,	1914	336,632	638,397	39,315	54	837	37,776	43,364	3,623	11,062	..	8,355	2,112	9,316
,,	*1913*	*418,221*	*731,520*	*22,073*	*100*	*637*	*46,304*	*33,281*	..	*265*	*2,000*	*15,751*	*5,005*	*9,057*
June,	1914	261,877	634,981	36,400	..	1,153	19,247	18,774	..	28,141	1,000	7,924	4,258	7,881
,,	*1913*	*315,034*	*528,815*	*24,444*	*588*	*79*	*3,166*	*18,741*	..	..	*13,072*	*13,592*	*4,065*	*5,439*
July,	1914	225,411	239,143	38,170	..	1,355	2,003	15,868	..	1,425	1,000	5,810	2,584	8,053
,,	*1913*	*215,713*	*331,353*	*14,030*	..	..	*1,687*	*17,169*	*5,651*	*300*	*9,190*	*9,682*	*1,720*	*10,793*
August,	1914	84,251	63,111	19,094	516	1,979	50	4,845	600	38,220	10,403	367	245	3,705
,,	*1913*	*161,593*	*178,263*	*13,129*	*6*	*8*	*407*	*8,494*	*11,604*	*45*	*38,480*	*3,714*	*2,310*	*6,406*
September,	1914	53,386	49,200	2,353	..	15,885	..	3,337	..	5,896	7,288	1,143	57	..
,,	*1913*	*133,122*	*83,521*	*5,334*	*16*	*6,575*	*2,020*	*7,176*	..	..	*16,336*	*3,826*	*1,501*	*10,049*
October,	1914	291,432	128,016	49,104	..	81,842	30,487	8,938	..	68,660	38,121	2,042	1,650	1,683
,,	*1913*	*14,122*	*25,735*	*580*	..	*42,847*	*21,452*	*2,705*	..	..	*10,020*	*6,986*	*3,672*	*2,923*
November,	1914	136,346	27,577	48,302	27	98,729	70,048	37,604	15	24,289	35,783	885	110	1,377
,,	*1913*	*20*	*1,479*	..	..	*53,468*	*23,722*	*1,891*	..	..	*2,478*	*4,162*	*771*	*2,314*
December,	1914	192,952	149,835	44,876	..	172,990	80,114	86,317	..	..	9,306	1,136	116	2,157
,,	*1913*	*128,087*	*86,890*	*8,909*	..	*249,526*	*124,821*	*51,385*	..	*250*	*24,479*	*19,807*	*5,276*	*11,273*

HEMP AND TOW GRADING RETURNS.

FEBRUARY.

Hemp.—The total number of bales graded was 8,477, as compared with 13,709 for the corresponding month of last year, a decrease of 5,232 bales. For the twelve months ending 28th February, 1915, the number of bales graded was 88,069, as compared with 163,347 for the previous twelve months, a decrease of 75,278 bales.

Tow.—During the month 2,174 bales were dealt with, as compared with 4,126 for the corresponding month of last year, a decrease of 1,952 bales. For the twelve months ending 28th February, 1915, the number of bales graded was 25,666, as compared with 54,168 for the previous twelve months, a decrease of 28,502 bales.

Stripper-slips.—During the month the number of bales graded was 271, as compared with 188 for the corresponding month of last year, an increase of 83 bales. For the twelve months ending 28th February, 1915, the number of bales graded was 1,357.

HEMP, TOW, AND STRIPPER-SLIPS GRADED THROUGHOUT THE DOMINION DURING THE MONTH OF FEBRUARY, 1915.

Hemp.

Port.	Superior.	Fine.	Good-fair.	Fair.		Common.	Rejected.	Condemned.	Total.
				High Point.	Low Point.				
	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.
Auckland ..	..	..	6	137	215	56	2	..	416
Napier	..	..	..	..	..	..	..	..	..
Foxton ..	..	..	1,676	1,302	428	59	19	1	3,485
Wellington ..	..	229	1,342	1,931	229	19	10	..	3,760
Blenheim ..	..	15	81	1	..	..	..	..	97
Picton ..	..	81	119	25	..	..	..	..	225
Lyttelton ..	..	..	..	..	..	..	..	..	..
Dunedin ..	..	..	149	32	..	..	..	..	181
Bluff	..	..	5	163	145	..	..	..	313
Totals ..	..	325	3,378	3,591	1,017	134	31	1	8,477
Percentages of totals	..	3·83	39·85	42·36	12·0	1·58	0·37	0·01	..

Tow.

Port.	First Grade.	Second Grade.	Third Grade.	Condemned.	Total.
	Bales.	Bales.	Bales.	Bales.	Bales.
Auckland ..	..	51	100	3	154
Napier	..	..	..	..	..
Foxton ..	197	383	93	..	673
Wellington ..	249	532	38	..	819
Blenheim ..	31	57	14	..	102
Picton	..	106	..	..	106
Lyttelton ..	..	..	..	..	..
Dunedin ..	43	29	..	..	72
Bluff	12	31	172	33	248
Totals ..	532	1,189	417	36	2,174

Stripper-slips —Foxton: Second grade, 247. Wellington: Second grade, 24.

NEW ZEALAND-SAN FRANCISCO TRADE.

FOLLOWING are the shipments of produce for San Francisco, Tahiti, and Rarotonga, and transhipments for Vancouver from New Zealand, since September last:—

—	"Marama," 15th Oct.	"Maitai," 12th Nov.	"Moana," 10th Dec.	"Marama," 7th Jan.	"Maitai," 4th Feb.
Gum, packages	30	12	10	..	30
Milk, cases	..	..	..	..	1,000
Grain, &c., sacks	107	32	169	36	10
Meat, cases	8	37	16	82	..
Onions, cases	7	2	5	9	11
Potatoes, sacks	29	3	10	26	30
Sundries, packages	328	629	403	287	435
Butter, boxes	5	4	521	180	..
Hemp, bales	114	456	331	..	..
Frozen lamb, carcases	2	5	5	2,202	..
Hides and sheep-skins, sacks and bales	463	250	88	145	2
Beef, quarters—pieces	..	..	..	20	..
Veal, carcases	..	..	..	26	..
Cheese, crates	..	..	..	154	..
Sheep-skins, bales	..	..	..	48	15

NEW ZEALAND-VANCOUVER TRADE.

FOLLOWING are the shipments of produce for Vancouver and North American ports from New Zealand since September last:—

—	"Makura," 29th Oct.	"Niagara," 1st Dec.	"Makura," 29th Dec.	"Niagara," 26th Jan.	"Makura," 22nd Feb.
Butter, boxes	4,850	3,650	2,350	9,159	8,175
Mutton, carcases	..	..	..	1,041	78
Lamb, ,,	..	..	..	444	175
Beef, quarters—pieces	..	..	..	247	221
Veal, carcases	..	..	..	10	23
Frozen sundries, packages	..	..	..	17	22
Wool, bales	109	348	165	109	210
Grass-seeds, beans, &c., sacks	..	23	..	22	..
Hides and skins, sacks, &c.	1,054	2,442	1,984	1,368	1,277
Onions, cases	..	..	..	60	1,333
Sheep-skins, bales	..	522	501	230	136
Jam, cases	..	25	..	..	..
Sundries, packages	45	34	53	210	..
Pelts, casks	34	25	28	45	83
Kauri-gum, packages	840	10	89	..	..
Hemp, bales	246	..	..	340	264
Rabbits, crates	..	..	..	..	..
Timber, pieces	..	..	..	..	..
Eggs, cases and crates	974	255	..	..	..
Meats (canned, &c.), cases	..	..	..	..	..
Cheese, crates	..	..	..	..	..
Fresh fruit, cases	..	..	..	..	..

STOCK EXPORTED.

THE following table shows the numbers and descriptions of stock exported from the Dominion during the month of February, 1915 :—

Port of Shipment.	Horses.			Sheep.			Cattle.		Pigs.		Dogs.		
	To Australia.	To Pacific Islands.	To Montevideo.	To Australia.	To Pacific Islands.	To South America.	To Australia.	To Pacific Islands.	To Australia.	To Pacific Islands.	To Australia.	To Pacific Islands.	To U.S. of America.
Auckland ..	..	4	..	..	84	..	..	23	..	25	..	4	..
Gisborne ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Napier ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wellington ..	5	..	..	53	..	1	..	..	..	..	4	..	1
Lyttelton ..	3	..	..	1,706	..	..	..	..	..	..	4	..	..
Dunedin ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bluff ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals ..	8	4	..	1,759	84	1	..	23	..	25	8	4	1

Auckland also exported 11 crates of poultry to the Pacific islands.

The following are particulars of horses exported: Thoroughbred, 4; draught, 5; light horses, 3.

STOCK IN QUARANTINE.

THE following stock was received into quarantine during the month of February, 1915 :—

No.	Description.	Sex.	Port of Origin.	Owner or Agent.	Address.
			SOMES ISLAND, WELLINGTON.		
2	Berkshire pigs..	Female	Sydney ..	J. G. Cobbe (Messrs. Fletcher and Co.)	Feilding.
1	Shorthorn ..	Male ..	,, ..	J. G. Wright ..	Wellington.
			QUAIL ISLAND, LYTTELTON.		
1	Jersey ..	Male ..	London ..	F. E. Hillyer ..	North-east Harbour.

AGRICULTURAL SHOW DATES.

Southland Metropolitan A. and P. Association.—Invercargill, 18th, 19th, 20th, and 21st May, 1915.

Otago A. and P. Association.—Dunedin, 1st, 2nd, 3rd, and 4th June.

Waikato Winter Show Association.—Hamilton, 1st to 5th June, 1915.

Manawatu and West Coast A. and P. Association.—Palmerston North, 22nd 23rd, 24th, and 25th June, 1915.

South Taranaki Winter Show.—Hawera, 30th June, 1st, 2nd, and 3rd July.